SIBOGA-EXPEDITIE.

Siboga-Expeditie

UITKOMSTEN

OP

ZOOLOGISCH, BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED

VERZAMELD IN

NEDERLANDSCH OOST-INDIË 1899—1900

AAN BOORD **H. M. SIBOGA** ONDER COMMANDO VAN

Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
LEIDEN

Siboga-Expeditie
XIII b³

THE

GORGONACEA OF THE SIBOGA EXPEDITION

VI. THE GORGONELLIDÆ

BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

With 11 plates

(Aided by a grant from the ELIZABETH THOMPSON SCIENCE FUND)

LATE E. J. BRILL
PUBLISHERS AND PRINTERS
LEYDEN — 1910

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Family GORGONELLIDÆ Studer.

Gorgonellaceæ Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Gorgonellacées Milne Edwards et Haime. Histoire naturelle des Coralliaires, II, 1857, p. 182.
Ellisellidæ + *Calligorgiidæ* (pars) Gray. Catalogue of Lithophytes in the British Museum, 1870, pp. 24, 34.
Gorgonellaceæ Kölliker. Icones Histiologicæ, II, 1865, p. 139.
Gorgonellidæ Studer. Anthozoa Alcyonaria, welche während der Reise S. M. S. Gazelle um die Erde gesammelt wurden, 1878, p. 656.
Gorgonellidæ Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Gorgonellidæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 153.
Gorgonellidæ Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 116.
Gorgonellinæ Délage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 428.
Gorgonellidæ Nutting. Hawaiian Alcyonaria, 1908, p. 597.
Gorgonellidæ Thomson and Simpson. Alcyonaria of the Indian Ocean, part II, 1909, p. 265.

This family seems to be a fairly natural one, and may be defined as follows:

Gorgonacea with an amorphous calcareous axis cylinder which is not jointed and the core of which is solidly calcareous and often surrounded by concentric lamellæ of alternating calcareous and horny layers. The axis is never composed of fused spicules. The branches often show a median bare space and furrow, especially when flattened. The polyps are retractile,

and the tentacle bases are beset with spicules. The spicules are almost always girdled forms, i. e. with a median band which is bare of verrucæ, and hence appear to have an impressed girdle. This results in the formation of double heads, double clubs, double spindles, double stars, etc.; and these forms are quite characteristic of the Gorgonellidæ, although not strictly confined to this family.

Dichromatism is exhibited in a marked degree, a number of species of *Juncella* and *Scipearella* being characterized by having two color phases, red and white, which do not appear to be corellated with sex or age.

The systematic arrangement of this family offers great difficulties, as is apt to be the case with forms which have been long known. The original descriptions are entirely inadequate, and it is usually impracticable to decide just what forms the authors had before them. None of them paid any attention to the feature that has later been found of prime importance in generic definitions, e. g. the spicules, and confined themselves almost exclusively to general habit, mode of branching, etc., features of almost no generic import whatever. Subsequent writers have very generally neglected the discussion of the genera in any broad way.

Milne Edwards and Haime (1857) recognize the four genera *Juncella*, *Ctenocella*, *Gorgonella* and *Verrucella*, which they separated by modes of branching and character of the calyces. Kölliker (1865) was the first to thoroughly investigate the spicules of this family, and he recognized the genera *Gorgonella*, *Juncella* and *Verrucella*; but included the genus *Riisea* of Duchassaing and Michelotti, which appears to belong to the family Chrysogorgidæ. He includes the genus *Ctenocella* in his genus *Gorgonella*.

Gray (1870) divides the genus *Juncella* into the three genera *Juncella*, *Ellisella* and *Vimenella* and restores the genus *Scirpearea*. He established the genera *Nicella*, *Reticella*, *Raynerella*, *Phenella* and *Heliana*. Two of these, *Reticella* and *Raynerella*, appear to belong to *Gorgonella*.

Studer, (1878) discusses and further defines the genera *Gorgonella*, *Juncella*, *Ellisella*, *Ctenocella* and *Scirpearella*; and in 1887 the same writer gives a careful discussion of the genera of this family, defining according to modern methods the following genera: *Nicella*, *Scirpearea*, *Juncella*, *Ellisella*, *Verrucella*, *Gorgonella*, *Ctenocella*, *Phenelia* and *Heliana*. The last two of these genera he defines after Gray without giving the spicule characters which are absolutely necessary for modern definition. This treatment is the most satisfactory that has yet been presented, and the generic definitions here given are very largely adopted without essential modification by the present writer.

The last general treatment of the family Gorgonellidæ as a whole is found in Wright and Studer's Challenger Report, Alcyonaria, 1889, p. 153, where the definitions of Studer, as just discussed, are practically adopted in their entirety. They add, however, one genus, *Scirpearella* and throw doubt on the identity and validity of the old genus *Scirpearea* of Cuvier, quoting the discussion of *Scirpearea mirabilis* by Kölliker [1] who shows that the name was originally used for a pennatulid.

Thomson and Simpson, in their excellent monograph of the Alcyonaria secured by the

[1] Anat.-Syst. Beschr. der Alcyonarien, Die Pennatuliden, 1872, p. 26.

Investigator in the Indian Ocean, Part II, 1909, p. 265 et seq. merely name the family. They distinctly recognize the great difficulty and perplexity attending the work of the systematist in this family, saying (p. 267), in reference to their new species *Nicella pustulosa*:

"It is a matter of no small difficulty to distinguish between *Nicella, Gorgonella* and *Verrucella*. Distinctions based on spicules alone are very unsatisfactory in this group because the spiculation varies at different levels and transition forms are so numerous and varied that it is sometimes almost impossible to distinguish between double spheres, double stars and double clubs, each in turn passing gradually to double spindles".

Again, on page 269:

"The system of classification which at present obtains in regard to the Juncella group of gorgonellids, including *Juncella*, *Ellisella, Scirpearea* and *Scirpearella* is far from satisfactory. In fact it is a debatable question whether these should be ranked as separate genera. Many of the species which have from time to time been described have unquestionably been established on young colonies, and, in addition to this, the characters which are taken as diagnostic, e. g. arrangement and retractility of verrucæ, vary so much in individual specimens that little or no importance can be attached to them".

These writers content themselves with a table, giving a comparison in numerous details of the several specimens collected by the Investigator, without attempting to name them.

The present writer, although profoundly impressed with the extreme difficulty of the problem, does not feel justified in turning his back on these perplexities. The amount of material belonging to the Gorgonellidæ secured by the Siboga Expedition is so considerable, representing some 21 species, that an attempt will be made to straighten out as many of the difficulties as may be. While entire success is not to be hoped for, some progress toward a reasonably correct generic classification should be possible.

First, however, it is necessary to more clearly define the main types of spicules that present, after all, the best basis of classification in this, as in other groups.

As already indicated, nearly all of the spicules which present characteristic features of value for our purpose are "girdled spicules". The basic form from which nearly all of the others are derived is the girdled spindle, showing at its middle a smooth impressed zone, free from verrucæ. This form differs from the typical spindle only in the fact that this zone is more conspicuous in the girdled form. The typical spindle is terete in form and its surface is ornamented with more or less regular whorls of tubercles. Between the whorls are comparatively bare zones, and such a zone is very constantly seen near the centre of the spicule. It is only when such a zone is comparatively large and conspicuous that a "girdled spindle" is produced. This basic form is modified in the following ways:

1st. Symmetrical forms

a. The girdle divides two similar parts of the original spindle in such a manner that each part bears verrucæ and is terete in outline. This produces the . . . . . Double Spindle.

b. The girdle divides two similar parts each with its outer end somewhat turgid and armed with verrucæ, resulting in the. . . . . Double Club.

c. The girdle divides two similar parts which are spherical in outline and are ornamented with symmetrically disposed verrucæ. Such an arrangement results in the spicule which we will call the. . . . Double Head.

d. The girdle divides two similar parts which are spherical in outline and ornamented with radiating points. These are . . . . . Double Stars.

e. The spicule is rod-like in general form, with a girdle dividing two parts which are gradually enlarged toward the outer ends, have comparatively straight sides, rounded distal corners and are covered with fine and densely aggregated verrucæ. These will be called . Double Bars.

f. The spicule is rod-like, without the girdle. . . . . Bars.

2nd. Unsymmetrical forms.

a. The girdle separates two unlike parts, one a club and the other a star. Such forms may be called . . . . . Club-Stars.

b. The girdle separates two unlike parts, one a club and the other a head. Forms of this kind may be called . . . . . Club-Heads.

c. The girdle separates two unlike parts, one a star and the other a head. These will be called . . . . . Star-Heads.

d. The girdle separates two unlike parts, one a club and the other a spindle. This rather rare form may be called. . . . . Club-Spindle.

e. The girdle separates two unlike parts, one a star and the other a spindle. These may be designed as . . . . . Star-Spindles.

Besides the above, which may be called girdled forms, there are often crosses produced by a double head being longitudinally divided by an impressed vertical zone.

While it is true that a given species, or even a single specimen, may show several of these forms and numerous intergradations, it is also true that certain forms predominate in a given genus, and it is these dominant types of spicules, and not the others, that are available for generic diagnosis [1].

While the spicules are the most important features for generic distinctions, we may also avail ourselves of any other character which seems to be possessed by a group of allied species, e. g. mode of branching, shape of calyces, character of axis, etc., in attacking the problem before us.

Artifical key to the genera of the Gorgonellidæ.

Main branches arising from a forking of the main stem. Colony flabellate, widely diverging, the main branches bearing a series of simple branchlets on upper side only. Branchlets vertical and parallel, and resembling the teeth of a comb . . . . . **Ctenocella**

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[1] See a discussion on this point, as well as a statement of the position of the author on the matter of the retention of established generic names, in the Report on the Muriceidæ of the Siboga Expedition, Nutting, 1910, p. 5.

Colony simple, or, if branched, not bearing branchlets in the manner described above. Spicules:

Club-stars and double stars.	Juncella
Lenticular, disk-shaped or fiddle-shaped.	Plumigorgia
Much larger, bar-shaped, sometimes lenticular; surface smooth	Isidoides
Double bars or girdled bars	Nicella
Spindles and clubs predominating.	Ellisella.
Double heads and girdled spindles largely predominating.	
Colony flabellate, often reticulate; calyces low verrucæ.	Gorgonella.
Colony flabellate or dichotomous, the heavily spiculated bases of tentacles forming an 8-rayed pseudo-operculum, star-like when viewed from above	Verrucella
Colony simple, forked or bushy; calyces usually in spirals, prominent; spicules often cruciform, although not abundant	Scirpearella

The genus *Scirpearea* is apparently invalid, as the name was used originally for a pennutalid, according to LAMARCK [1].

Later LAMARCK (Hist. Nat. Anim. sans vert., II, 1836, p. 614) places this in his genus *Funiculina*. This writer points out that this species has been erroneously confounded with *Pennatula mirabilis* Linn. WRIGHT and STUDER (Challenger Report, Alcyonaria, 1889, p. 155) say that the type specimen of *Funiculina cylindrica* Lamk. is a gorgonellid (and probably a *Juncella*). Studer, however, had previously figured a couple of spicules of *Scirpearea mirabilis* Cuv. in the plate (Plate V, 29) and *Scirpearea mirabilis* Pallas in the text, of his paper in the Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 660.

It is impossible at this time to disentangle the real situation and to determine just what CUVIER had before him which he named *Scirpearea mirabilis*. In view of this situation it seems best to abandon the genus altogether.

The following genera are not represented in the collection made by the Siboga, neither do they seem to have received adequate definition at any time. Without further discussion the definitions of STUDER [2] are given in translation as follows:

"*Phenilia* Gray. Colony arborescent, with short, divergent, usually quadrate branches which sometimes coalesce. Calyces low, in two or three irregular rows on both sides of the branches. Cœnenchyma horny, with plain lateral grooves. Spicules?"

"*Heliana* Gray. Colony tree-like, branching dichotomous? Twigs ascending and divergent. Lower twigs occassionally anastomosing. Cœnenchyma hard, horny. Calyces exserted, subcylindrical short, sometimes bent, in two three or four alternating rows on the sides of the twigs, and irregularly disposed on the branches. Axis hard, stony, gray-brown".

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[1] *Scirpearea mirabilis* Cuvier, (Règne Animal, 1 ed. IV, 1817, p. 85) *Pennatula mirabilis* Pallas.

[2] Versuch eines Systemes der Alcyonaria, 1887, pp. 68, 69.

Synoptic view of the genera and species of Gorgonellidæ collected by the Siboga Expedion.

New species are indicated by an asterisk (*).

Gorgonella.

G. orientalis, *umbraculum*, **delicatula*, **rigida.*

Verrucella.

V. rubra, *flaviflora* (new name), **stellata.*

Ctenocella.

C. pectinata.

Juncella.

J. juncea, *gemmacea*, *racemosa*, **sanguinea.*

Scirpearella.

S. rubra, *gracilis*, **regia*, **hemispherica.*

Nicella.

*N. *coralloides*, **carinata.*

Ellisella.

*E. **flava.*

Plumigorgia (new genus).

*P. **hydroides.*

Isidoides (new genus).

*I. **armata.*

The table shows that the Siboga Expedition secured 21 species of Gorgonellidæ 11 of which are new; and that these species were divided among 9 genera, 2 of which are new.

Systematic description of genera and species.

Genus **Gorgonella** Valenciennes (modified).

Gorgonella Valenciennes. Comptes-rendus, tome XLI, 1855, p. 14.
Gorgonella Milne Edwards et Haime. Histoire Naturelle des Coralliaires, Vol. I, 1857, p. 183.
Gorgonella Kölliker. Icones Histiologicæ, II, 1865, p. 139.
Gorgonella Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 661.
Gorgonella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Gorgonella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.
Gorgonella (Val. emended), Délage et Hérouard. Traité de Zoologie concrète, II, 2, 1901, p. 428.
Gorgonella Hickson. Alcyonaria of the Maldives, 1905, p. 817.

The original discription of this genus is as follows:

"Le sclerobase ramifie en fines branches rameuses et très-divisées".

Milne Edwards and Haime (1857) define the genus as follows:

"Colony much branched, cœnenchyma very thin; calyces included or but little exserted". (Translation).

Kölliker (1865) appears to have been the first to make a critical study of the spicules of this genus. His definition, freely translated, is as follows:

"Axis commonly without layers, radiately striated. Calyces when evident, low warts. Spicules of the cœnenchyma warty double spheres and double spindles. .07 to .1 mm. in length Polyp spicules are spindles .13 mm. long.

Studer (1878) accepts the genus as originally defined by Valenciennes, and in 1887 he formally defined the genus as follows:

"*Gorgonella* Milne Edwards et Haime. Colonie mannigfach in einer Ebene verzweigt, oft durch Anastomosen der Zweige ein Netzwerk bildend. Kelche niedrig warzenförmig an zwei Seiten der Äste angeordnet. Achse lamellös, radienstreifig. Im Cœnenchym warzige Doppelkugeln und Doppelspindeln".

Wright and Studer (1889) define the genus practically as just quoted. Hickson (1905) points out the difficulty in distinguishing between *Gorgonella* and *Verrucella.*

The definition adopted for the present work will be as follows:

Colony flabellate, often reticulate; calyces low dome-shaped, or low truncated cones; calyces on two or three sides of the branches, usually the former except on ultimate branches; cœnenchyma thin; axis solidly calcareous, without horny lamellæ; spicules double heads, girdled spindles and true spindles.

The type species of this genus is *Gorgonella sarmentosa* (Lamarck). Other known species are *Gorgonella bianci* Koch, *G. distans* Studer, *G. granulata* Esper, *G. miniacea* W. and S., *G. orientalis* W. and S., *G. stricta* (Lamk.), *G. sarmentosa* (Lamk.), *G. umbella* (Esper), *G. umbraculum* (Ellis and Solander), *G. verriculate* Milne Edw. and Haime, and the new species of the Siboga collection.

The writer believes that *Nicella reticulata* and *N. pustulosa* of Thomson and Simpson (Alcyonarians of the Indian Ocean, Vol. 2, 1909, pp. 266, 267) should be included in the Genus *Gorgonella.* Their spicules are typical of that genus rather than of *Nicella.*

1. *Gorgonella orientalis* Wright and Studer.

Gorgonella orientalis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 161.

Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters.
Stat. 305. Mid channel in Solor Strait off Kampong Menanga. 113 meters.
Stat. 306. 8° 27′ S., 122° 54′.5 E. 247 meters.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony (fragmentary) flabellate and reticulate in form. The specimen described is the terminal part of a branch of a colony that was probably much larger. Height 6.1 cm., diameter 5.6 cm. The central branch is connected by numerous anastomoses with two others, one on each side. The diameter of the largest branch is 2.5 mm. This forks 4 mm. above its proximal end and each of the resulting branches gives off several lateral branchlets that anastomose freely with branchlets from other branches. Ultimate branchlets from 1.5 mm. to 9 mm. apart. The calyses are distributed on three sides of the branches, are thickly emplanted, and have a tendency to a lateral arrangement. There is no evident longitudinal furrow or ridge on the branches.

The individual calyces are rather low, dome-shaped verrucæ with evenly rounded summits and with their walls often contiguous. Their distal ends show a faintly indicated rosette or star-shaped pattern, not nearly so evident as in *Verrucella.* A typical calyx measures .9 mm. in height and has a diameter of 1.8 mm. The walls are remarkably thick and tough, consisting

of a dense mass of spicules immersed in a tough matrix of connective tissue. The polyps are completely retractile and the upper surfaces of the tentacles are encrusted with spicules, many of which are transversely placed.

The axis is hard, calcareous and without corneous layers.

Spicules. These are double heads and girdled spindles whose surfaces are covered with verrucæ which are often in whorls and not so massed together as in *Nicella*. There are also true symmetrical spindles with pointed ends and regular whorls of verrucæ; and many intergradations between the double heads and girdled spindles, and between the latter and true symmetrical spindles. A few crosses are also seen.

Color. The colony is yellowish brown in color, ocraceous in places, and also shows areas of grayish brown. The polyps are colorless in alcohol.

General distribution. The type locality is the *Hyalonema* ground, off Japan. 345 fathoms.

This specimen is referred with some hesitation to this species. Taking into account the changes in form of the calyces in different stages of contraction it agrees fairly well with the original description.

2. *Gorgonella umbraculum* (Ellis and Solander).

Gorgonia umbraculum Ellis and Solander. Natural History of Zoophytes, 1787, p. 80.
Gorgonia umbraculum Lamouroux. Exposition Méthodique, 1821, p. 34.
Rhipidigorgia umbraculum Valenciennes. Comptes rendus, Acad. Sci., Paris, 1855, p. 13.
Rhipidigorgia umbraculum Milne Edwards et Haime. Hist. nat. des Coralliaires, 1857, p. 178.
Umbracella umbraculum Gray. Proc. Zool. Society of London, 1857, p. 288.
Gorgonella umbraculum Verrill. Bull. Museum of Comp. Zool., 1864, p. 37.
Gorgonella umbraculum Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 118.

Stat. 204. 4° 20′ S., 122° 58′ E. 75 to 94 meters.

Colony strictly flabellate and reticulate, 15 cm. in height and with a spread of 8.2 cm. Main stem 2.7 cm. long and 2.8 mm. in diameter. At its distal end it breaks up into three branches, one of which forms nearly the whole of the specimen. This branch is fairly symmetrical in itself. Considering it as a colony its main stem is 1.4 mm. long and 2.6 mm. in diameter, round in section, and devoid of calyces. It can be traced for 4.4 cm. before it breaks up and is dissipated in the general network of the colony. It gives off alternate branches which are short or feebly branched, except the upper one which curves upward and outward nearly to the top of the colony, giving off numerous lateral twigs which go to form the reticulate mass. The anastomoses are quite numerous. The ultimate branchlets are very short, and about 3.6 mm. apart, and very slender, being about 1 mm. in diameter. One side of the branched colony is devoid of calyces. The latter are in two alternating rows, but are not strictly lateral being more on the side opposite the nude face, and, if that be regarded as anterior, being antero-lateral in position.

The calyces are more like truncated cones than verrucæ; or, they may be likened to domes with their tops removed. A typical one measures 1.1 mm. in height and 1.5 mm. in diameter. The top is flattened, not rounded as in *G. rigida*, and there is a distinct series of 8 lobes around the margin. The dorsal surface of the tentacles bears a number of spicules, principally girdled spindles.

The cœnenchyma is thin, and the axis solidly calcareous.

Spicules. These are mostly double heads and girdled spindles, as in the last species. A few small, regular tuberculate spindles and clubs are also seen. The tubercles, although closely set, are usually plainly in whorls on the spindles. Sometimes the girdle is obliterated by such a whorl.

Color. The colony is bright scarlet throughout.

General distribution. The type locality is Batavia; East Indies in general.

3. *Gorgonella delicatula* new species. (Plate I, figs. 2, 2*a*; Plate X, fig. 1).

Stat. 257. In Duroa Straits, Kei Islands. To 52 meters.

Specimens fragmentary, the largest being a flabellate branch, incomplete at both ends, 5.4 cm. long. The main branch is curved in a very open "S", and gives off seven branchlets from one side, four of which are compound; and four branches from the other side, three of which are compound. The branchlets give off ultimate twigs in an irregularly alternate manner. The main branch is but 1.2 mm. in diameter, and the ultimate twigs about .5 mm. The latter are usually regularly curved. The calyces are lateral and alternate in position.

The individual calyces are very low rounded verrucæ, a typical one measuring .5 mm. in height and 1.1 mm. in diameter at the base They are about 1 mm. apart, on the average, and vary greatly in size. The ends of the twigs are swollen, and contain two opposite calyces that are considerably larger than the others. In general, however, the calyces are much smaller than in any other species of this genus in the collection. There are a few minute spicules on the dorsal surfaces of the tentacles, but it is difficult to ascertain their arrangement.

The axis is very hard, calcareous, with very deep grooves or impressions of the water-vascular canals. The cœnenchyma is thin.

Spicules. These are much like those of *Gorgonella rigida*, consisting of very heavily tuberculated girdled spindles, quite stout, oval in outline and with the girdle often obliterated by the encroachment of the tubercles. The double heads are relatively much less abundant than in other species of the genus in the collection, and regularly tuberculate spindles with the tubercles in whorls seem to be lacking.

Color. The colony is bright coral red, distal parts of the calyces yellow and the polyps (in alcohol) white.

This species is much more delicate than any other member of the genus that the writer has seen.

4. *Gorgonella rigida* new species. (Plate I, figs. 3, 3*a*; Plate X, fig. 2).

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters.
Stat. 204. 4° 20′ S., 122° 58′ E. 75—94 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 305. Mid channel in Solor Strait off Kampong Menanga. 113 meters.

Colony incomplete, the basal portion and two large branches being present, flabellate in form. The root forms a lobular mass growing over a pebble. Main stem to first branch 14 mm. long and 1.9 mm. in diameter, round in section. The first branch is large, and grows outward and then curves downward and outward again, and attains a length of 4.6 cm. It gives off four stiff branchlets from its upper side, three of which give off branchings of the 3rd order. Above the first branch the main stem gives off three branches on one side and two on the other. The lower of these latter is a large branch which gives off two branchlets from its lower side (one of which is compound) and three from its upper side (one of which is compound). There are no anastomoses and the branches are all stiff and rigid. One side or face of the branches is devoid of calyces.

The calyces are alternate in position, but are not strictly lateral, being turned toward the face of the colony. The distance between calyces is about 1.3 mm. on the average. The axis is densely calcareous.

The individual calyces are low, dome-shaped verrucæ, one measuring .7 mm. in height and 1.3 mm. in diameter. When the polyp is retracted the calyx mouth is entirely obliterated, not leaving the rosette pattern of lobes often seen in allied forms. The mouth is indicated, however, by a spot of darker red color. The tentacles are heavily spiculated with tuberculate spindles.

Spicules. These are double heads, spindles and girdled spindles. All of these are more densely covered with tubercles than is the case in *G. orientalis*, and the spindles are stouter. Otherwise the spicules are much the same in the two species.

Color. The colony is a rather light scarlet, or coral red throughout. The calyx mouths are darker red, verging on crimson.

The differences in habit of growth, size of calyces and in the spicules seem sufficient to justify the separation of this form from *G. orientalis* and other members of the genus. It is near *G. distans*, Studer, but differs in the disposition of the calyces, which are in three to four rows in *G. distans* and in thickness of stem and branches.

Genus **Verrucella** Milne Edwards et Haime.

Verrucella (in part) Milne Edwards et Haime. Hist. Nat. des Coralliaires, I, 1857, p. 184.
Verrucella Duchassaing et Michelotti. Mémoire sur les Coralliaires des Antilles, 1860, p 33.
Verrucella Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Verrucella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Verrucella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.
Verrucella Studer. Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, p. 54.
Verrucella Délage et Hérouard. Traité des Zoologie concrète, II, 2, 1901, p. 429.

Verrucella Hickson. Alcyonaria of the Maldives, 1905, p. 817.
Verrucella Nutting. Descriptions of Hawaiian Alcyonaria, 1908, p. 597.

The original definition of this genus is as follows:

"Polypieroide très rameux, sclerenchyme assez épais. Calyces à bords verruciformes très-saillants".

Duchassaing et Michellotti (1860) accept the genus, but do not define it. Kölliker (1865) restricts the genus by separating from it *Juncella gemmacea* (*Verrucella gemmacea* Milne Edwards) and is the first to give careful attention to the spicules. A free translation of his definitiod follows:

"Axis calcareous, without lamellæ. Calyces very pronounced warts. The strongly calcareous bases of the tentacles forming an 8-rayed star within calyx opening. Spicules of the cœnenchyma beset with rounded and conical verrucæ; double heads with transitions to double and simple spindles (in two species with little thorny double stars). Polyp spicules flattened, small warty spindles and double spindles .12 to .20 mm. long, also found in the cœnenchyma, besides many small simple spindles".

Studer (1887) and Wright and Studer (1889) adopt the definition of Kölliker without material change. I find no subsequent discussion of the genus which adds anything of importance as to generic characters. The definition adopted for the present work is simply a condensation and modification of that given by Kölliker, as follows:

Gorgonellidæ with calcareous, usually homogeneous axis; colony variously branched but never simple; calyces verruciform, their distal portions rounded and including an 8-rayed star formed by the heavily spiculated tentacle bases. Spicules mainly double heads and girdled spindles intergrading with simple spindles.

The type species of this genus is hard to determine. The first species named by Milne Edwards and Haime is *Verrucella violacea*; but this species is correctly regarded by Kölliker as not belonging to the genus or family, but to the family Gorgonidæ. This being the case it seems safer to the present writer to indicate as the type *Verrucella guadeloupensis* Duch. et Mich., which conforms strictly to the definition of the genus and is the first species mentioned by Kölliker who was the first to define the genus according to modern methods. Other species are *Verrucella bicolor* Nutting, *V. candida* Ridley, *V. flexuosa* (Lamarck), ? *V. furcata* (Lamarck), *V. granifera* Kölliker, *V. guernei* Studer, *V. rubra* Thomson and Henderson and the new species about to be described.

1. *Verrucella rubra* Thomson and Henderson.

Verrucella rubra Thomson and Henderson. Ceylon Pearl Oyster Report, The Alcyonaria, 1905, p. 314.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony (incomplete) sparingly branched in a straggling manner, 19.5 cm. high. Stem and branches of about equal diameter (1.5 mm.) troughout. The stem forks about 2.4 cm. from its proximal end. One of the resultant branches sends off a very short simple branchlet

2.8 cm. from its orgin. The remainder of this branch is simple and 9.2 cm. long. The other main branch gives origin to two branchlets, one of which is forked near its end on its inner side and is unbranched throughout its distal 11.6 cm. The stem and branches are round in section and the calyces are entirely included, or so nearly so that the surface seems smooth at first glance. There are, however, very slight swellings that indicate the positions of the polyps. These are mainly lateral in position and tend to form two alternating rows (or one zigzag row) on each side. The front and of the branches are largely devoid or polyps, although they occasionally invade these surfaces.

The individual calyces are indicated by very low swellings and by their mouths, which are 8-rayed in retraction, as is characteristic of the genus. These mouths are about 1.4 mm. apart on the average. The polyps are so strongly retracted that their characters can hardly be made out. The basal portions of the tentacles are thickly encrusted with warty spindles and have no very definite arrangement. There is a tendency, however, to a longitudinal disposition.

A cross section of a branch shows a fairly thick cœnenchyma and an axis which appears to be solidly calcareous without the concentric lamellae of alternating hard and soft layers characteristic of several genera of Gorganellidæ.

Spicules, The outer layer is composed mainly of small very characteristic double heads. The inner cœnenchyma is filled with usually larger girdled spindles, terete spindles, a few double crosses and an occasional very small club.

Color. The entire colony is of a dull pink color.

General distribution. Type locality is in the Gulf of Mannaar.

This specimen has a considerable superficial resemblance to certain slender plexaurids. It is a true gorgonellid, however, but with entirely immersed calyces.

2. *Verrucella flaviflora* new name. (Plate I, figs. 1, 1*a*.);

Stat. 47. Bay of Bima, near South fort. 55 meters.

Colony subflabellate in form, 29 cm. in height. The main stem divides dichotomously four times and attains a height of 12.5 cm. Above the basal forking it is round and 3 mm. in diameter. 1.7 cm. above its base it divides into three branches in a curious manner, as if the outer branch were stuck on to where the others fork. The further branching is dichotomous in the main, but in one large branch it is unilateral, there being six upright and parallel branchlets from one side. The terminal twigs are often quite long, one being about 15 cm. in length. These twigs are flattened, this appearance being exaggerated by the fact that the calyces are bilaterally arranged. A slight elevated ridge or keel is evident on one side of many of the branches, and sometimes this can be seen on both sides. The twigs are 1.7 mm. × 2.2 mm. in cross section. The calyces are all lateral and usually in a single row on each side. They are emplanted, however, alternately toward the front and back of the colony, thus giving the appearance of two rows. They are rather regularly spaced, the distance between them being usually under 1 mm.

The individual calyces are in the form of truncated cones, often somewhat inclined toward the distal end of the branch, but perhaps quite as frequently directed straight outward. A typical calyx measures 1.2 mm. in height and 1.7 mm. in diameter at its base. The walls are often transversely corrugated near the base, as if by the strong contraction of the polyps. The margin is divided into eight evident lobes, often giving an appearance characteristic of the genus Verrucella as originally defined. The tentacles are very thickly encrusted with densely tuberculate spindles forming a mosaic of longitudinally disposed spicules.

A cross section of a branch shows a fairly thick cœnenchyma, large water-vascular canals immersed in the cœnenchyma; and an axis cylinder without horny layers, being composed entirely of limestone and showing concentric markings.

Spicules. The most common form by far is the form that I have called the girdled spindle, and that other writers often call a double spindle. Often the girdle is invaded by the verrucæ, and the result is a terete spindle encircled by close set whorls of verrucæ. Double heads are formed where the two ends of the spicule are rounded in outline. The form which KÖLLIKER calls the "double sphere"[1] is a double head which approaches the form of the girdled spindle, as that term is used in this work. Ordinary spindles with regular whorls of verrucæ are sometimes seen, and when one end is more turgid than the other, a club is formed.

Color. The colony is a deep scarlet; the polyps tinged yellow by the heavy coat of yellow spicules on the tentacles.

This species superficially resembles *Platycaulus* on account of the flattening of the branches. It also resembles *V. granifera* Köll., except in color and measurements of the calyces, *V. granifera* having calyces .8 mm. in height.

3. *Verrucella stellata* new species. (Plate II, figs. 1, 1*a*; Plate X, fig. 3).

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony subflabellate in form, branching dichotomously, general habit very slender, loose and straggling, 47 cm. in height. The main stem is 4 mm. in diameter, and forks 10.6 cm. above its base. The main branch on one side has five forkings at distances of 3 cm., 3.8 cm., 4.2 cm., 2.7 cm., and 2.8 cm. Or one might regard the main branch as sinuous, bearing five branchlets on its upper surface, all of the branchlets being dichotomously branched from one to four times. The branches are 3 mm. in diameter at their bases, and the ultimate twigs 1.5 mm. in diameter and sometimes attaining a length of 17 cm., the whole colony being much more delicate and slender than either of the other species examined. The cœnenchyma is thin. The calyces are very small scarcely evident verrucæ disposed on all sides of the branches except on proximal portions, where they are scattered or absent. There are none on the stem. There are four rows of calyces, including all sides of the branch which the rows encircle in

[1] Icones Histiologicæ, II, p. 140, Pl. XVIII, fig. 42.

a poorly marked spiral. There are no evident median bare spaces or grooves, and the calyces are much more distant than in other species of this genus in the collection. They are more sparsely scattered over the front and back than on the sides of the branches.

The individual calyces are low, dome-shaped verrucæ with their openings directed outward, not inward nor upward, as in *Juncella*. A typical one measures 1.5 mm. in diameter at the base and about .7 mm. in height. The apertures are star-like owing to the lobed margins below which the tentacle bases form a star-shaped figure, the tentacles themselves being infolded. The polyp bodies are short and stout, and their upper portions bear numerous small spicules transversely disposed. The tentacle bases are encrusted with spicules so as to form a sort of pseudo-operculum in retraction. A cross section of one of the larger branches shows a denser structure of the axis than in *Juncella*, but there is still a very distinct appearance of lamination. The water-vascular canals are very regularly disposed around the axis and a short distance outside of it. In a longitudinal section of a part of a branch round and regular openings are seen in the walls of the primary canals, and these communicate with the body cavities of the polyps.

Spicules. These are quite characteristic of the genus *Verrucella*. The most common forms are small, densely tuberculate double heads, the heads being separated by a narrow girdle. This girdle is often obliterated, forming oval densely tuberculate spindles. True tuberculate clubs are also found, as well as regular spindles. All possible gradations between the heads, clubs and spindles are found.

Color. The colony is a lively coral red throughout.

Genus **Ctenocella** Valenciennes.

Ctenocella Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Ctenocella Milne Edwards et Haime. Hist. Nat. des Coralliaires, 1857, p. 185.
Ctenocella Ridley. Zoological Collections of H. M. S. Alert, 1884, p. 348.
Ctenocella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Ctenocella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.

The original description of the genus *Ctenocella* is as follows:

"Le sclérobase s'allongeant en baguettes droites et pectinées d'un seul côté de la tige principale".

Milne Edwards and Haime (1857) define the genus as follows:

"Polypieroide s'allongeant en baguettes droites et pectinées d'un seul côté".

Studer (1887) gives an adequate definition of the genus which is freely translated as follows:

"Colony peculiarly pectinate, the twigs springing as unbranched upright switches from the upper sides of the branches. Calyces not prominent, on two sides of the branchlets. An evident median furrow is present (on the branches). The spicules are warty double clubs[1], those of the calyces being, according to Ridley, distinct from those of the cœnenchyma, being

[1] These spicules would be called "double heads" in the nomenclature adopted in the present work.

longer and with two or three whorls of tubercles. The middle whorl is in the centre of the spicule, so that the middle zone, so characteristic of the spicules of the cœnenchyma, is here absent".

This seems to have been the last formal definition of the genus, that of WRIGHT and STUDER in the Challenger Report (1889) being merely a translation of it, and may well stand as a characterization of the genus for our present purposes.

The type, and only known species is *Ctenocella pectinata* (Pallas).

1. *Ctenocella pectinata* (Pallas).

Gorgonia pectinata Pallas. Elenchus Zoophytorum, 1766, p. 179.
Gorgonia pectinata Ellis and Solander. Natural History of Zoophytes, 1786, p. 85.
Gorgonia pectinata Lamouroux. Histoire des Polypiers coralligènes flexibles, 1816, p. 416.
Ctenocella pectinata Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Ctenocella pectinata Milne Edwards et Haime. Histoire Naturelle des Coralliaires, 1857, p. 185.
Ctenocella pectinata Gray. Catalogue Lithophytes in the Collections of the British Museum, 1870, p. 26.
Gorgonella pectinata Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Ctenocella pectinata Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 657.
Ctenocella pectinata Studer. Versuch eines Systemes der Alcyonarien, 1887, p. 68.
Ctenocella pectinata Saville Kent. Great Barrier Reef of Australia, 1893, p. 200.
Ctenocella pectinata Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 119.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 299. 10° 52'.4 S., 123° 1'.1 E. Cyrus Bay, Rotti Island. 34 meters.
*Dutch South New Guinea. Dr. J. W. R. KOCH leg. 1904.

Like many other well known and striking forms this species seems not to have received detailed description.

Colony 21 cm. high and with a spread of 37.5 cm. The main stem is 2 cm. long and with a diameter of 5 mm. The main branches into which the stem forks extend almost horizontally outward proximally and then curve gradually upward in their distal portions. They have a basal diameter of 4 mm. and the longest one is 22.5 cm. in length. The branchlets are erect, strictly unilateral, parallel and usually simple. Occasionally, however, they are forked, and the proximal one on each branch bears ultimate branchlets which are also erect and parallel. The branchlets have an average diameter of about 2.3 mm., are closely set, regularly spaced and average about 4 to 5 mm. apart. The longest one is 14 cm. long. There are 33 branchlets on one branch and 34 on the other.

The median bare space is not well marked on the front and back of the branches, the calyces being distributed on all sides but more sparsely on the front.

The idividual calyces are very low verrucæ, often practically obsolete, and their openings are often so tightly closed as to be invisible. When not closed they are seen to be not at the summit of the verrucæ but exentric and often lateral, opening toward the side of the calyx, or inclined distally. The calyces are small, and so low that their dimensions can not

well be ascertained on account of there being no line of demarcation between their walls and the general surface of the cœnenchyma. Another specimen, from Station 299, has more prominent verrucæ, a typical one measuring 1.2 mm. in height and 1.5 mm. in diameter at base. It is papilliform, inclined distally and has a terminal aperture. The polyps are very small and have a few spicules on the their upper parts, included the tentacle bases.

Spicules. These are nearly all very compact double heads densely covered and with a very narrow girdle. There are also many stout spindles approaching an oval form and without any girdle. A few clubs are seen and an occassional small slender spindle probably from the polyps.

Color. The specimen described is a dull, dark red. Others are a creamy white, the species being apparently dichromatic.

General distribution. This species is widely distributed in the Indian Ocean and the East Indian region in general, Chinese Seas, and Australian region.

The largest specimen of this species in the collection is from Station 273. It is one meter in diameter and creamy white in color.

Genus **Juncella** Valenciennes.

Juncella (in part) Valenciennes. Comptes rendus a l'Acad. Paris, XLI, p. 14.
Juncella Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 186.
Juncella Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Juncella Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 655.
Juncella Versuch eines Systemes der Alcyonaria, 1887, p. 67.
Juncella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXV.
Juncella Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 116.
Juncella Délage et Hérouard. Traité de Zoologie concrète, II, 2, 1901, p. 429.
Juncella Hickson. The Alcyonaria of the Maldives, 1905, p. 818.
Juncella Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 269.

It is very difficult if not quite impossible to distinguish surely between the genera *Scirpearea* and *Juncella* of the earlier writers. The original definition of the genus *Juncella* is as follows:

"A tiges droites en baguettes, couvertes de cellules polypifères éparses sur la sclérobase".

Milne Edwards and Haime (1857) give practically the same definition, somewhat condensed. They include in the genus *Juncella juncea* Val., *J. vimen* Val. (= *Gorgonia Juncea* Ellis and Solander), *J. hystrix* Val., and *J. elongata* (Pallas).

Kölliker (1865) defines the genus as indicated in the following translation:

"Axis with alternating layers of horny and calcareous material. Part of the surface of the stem also pure limestone. Calyces reasonably well developed. Spicules of the cœnenchyma partly warty double heads and partly clubs and double stars .05 to .1 mm. long. Polyp spicules small spindles". This writer includes in the genus *Juncella juncea* (Esper) and *J. gemmacea* (Valenciennes).

Gray (Proceedings Zoological Society of London, 1859) divides the genus into several

genera, i. e. *Juncella*, *Ellisella*, *Vimenella* and ? *Helicella*, a step in which he has not been followed by later writers.

STUDER (1878) found that this perplexing group could be divided into two subordinate groups on the basis of the spicules, one group having an outer layer of clubs and an inner layer of double clubs, the other group being characterized by double clubs and spindles. By using this feature and certain characters of the calyces he arrived at a definition of the genus *Juncella* which may be translated as follows:

"Stem simple or dichotomously branched; calyces moderately or strongly exserted, club-shaped. Cœnenchyma thick, with an outer layer of clubs beneath which is a layer of double clubs". This author includes in the genus as thus defined *Juncella juncea* (Pallas), *J. flexilis* Studer, *J. gemmacea* (Valenciennes) and (provisionally) *J. vimen* Val. and *J. ævis* Verrill.

Later (1887) the same writer uses practically the same definition, but adds that the "Calyces are in two lateral rows", a character that does not hold, although repeated by WRIGHT and STUDER (1889).

HICKSON (1905) discusses the genus at some length and points out clearly the great difficulty in difining the genera of this family. He combines the genera *Juncella* and *Ellisella* of previous writers in the one genus *Juncella*. He would thus include about ten species in the genus. Four of these (*Juncella elongata* Val., *Ellisella calamus* Studer, *E. maculata* Studer, and *Juncella spiralis* Hickson) the present writer would not admit in the genus, using the very characters pointed out by HICKSON, i. e. the presence or absence of club-shaped spicules.

THOMSON and SIMPSON (1909) do not attempt to define the genus or to place the large collection of *Juncella* and its allies at their disposal in their proper genera or species. A course which they explain as follows:

"At the same time we refrain from multiplying species without some sound basis of classification. This we hope to supply in a future study".

The present writer, while naturally appalled by a task from which such able authorities shrink, feels that it is possible to make at least some progress in defining this perplexing group, and particularly that the genus *Juncella* itself is capable of being fairly well seperated from allied genera such as *Ellisella* and *Scirpearella*. He therefore suggests the following definition for the genus *Juncella*:

Colony simple or branched, never anastomosing and usually dichotomous when branched. Calyces usually on all sides of the colony, (except in young specimens where they are lateral) often leaving a bare space on two opposite sides of the branches, papillate or club-shaped, inclined distally, capable of partial retraction along with the strongly retracted polyp. Spicules in an outer layer of club-stars with club end beset with distally directed spines underneath which is a thick cœnenchyma with very numerous double heads and double stars. Axis cylinder with concentric layers of horny and calcareous matter.

The type species of this genus is *Juncella juncea* (Pallas). Other known species are *J. barbadensis* Wright and Studer, *J. flagellum* Johnston, *J. flexilis* Studer?, *J. fragilis* Ridley, *J. gemmacea* Valenciennes, *J. racemosa* Wright and Studer, *J. trilineata* Thomson and Herderson, and the new species described beyond.

A number of other forms have been ascribed to this genus, but they are so inadequately discribed as to make it impracticable to locate them properly.

1. *Juncella juncea* (Pallas). (Plate III, figs. 1—4).

Gorgonia juncea Pallas. Elenchus Zoophytorum, 1766, p. 180.
Gorgonia juncea Lamarck. Hist. Nat. Anim. sans Vert., 1816, p. 325.
Gorgonia juncea Ellis and Solander. Natural History of Zoophytes, 1786, p. 81.
Gorgonia juncea Pallas. Characteristic der Thierpflanzen, 1787, p. 226.
Gorgonia juncea Lamouroux. Hist. Polypes coral. flexibles, 1816, p. 419.
Gorgonia juncea Lamarck. Hist. Nat. Anim. sans Vert., 1836, p. 499.
Gorgonia juncea Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Juncella juncea Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 186.
Helicella juncea Gray. Proceedings Zool. Society London, 1857, p. 481.
Juncella juncea Verrill. Bulletin Museum Comparative Zoology, 1864, p. 37.
Juncella juncea Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Juncella juncea Gray. Catalogue Lithophytes Brit. Museum, 1870, p. 25.
Juncella juncea Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1883, p. 253.
Juncella juncea Ridley. Annals and Magazine of Natural History, Series V, Vol. XI, 1883, p. 253.
Juncella juncea Wright and Studer. Challenger Reports, Alcyonaria, 1889, p. 158.
Juncella gemmacea Wright and Studer. Challenger Reports, Alcyonaria, 1889, p. 158.
Juncella juncea Studer. Alcyonarien aus der Sammlung des Naturhist. Museums in Lübeck, 1894, p. 116.
Juncella juncea Hickson. Alcyonaria of the Maldives, 1905, p. 820.
Juncella juncea Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 314.
Juncella juncea Thomson and Crane. Alcyonarians from Okhamandal and Kittiawar, 1909, p. 133.

It is altogether likely that several described forms, where the description was based on young colonies (as was probably the case with several included in the above synonymy), should be included here.

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters.
Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.
Stat. 66. Bank between Islands of Bahuluwang and Tambolungan, south of Saleyer. 8 to 10 meters.
Stat. 162. Between Loslos and Broken Islands, West coast of Salawatti. 18 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. Near New Guinea. 32 meters.
Stat. 240. Banda Anchorage. 9 to 45 meters.
Stat. 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 meters.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters.

Colony unbranched, 64 cm. long. Axis calcareous, rigid proximally and flexible distally, with a round cross section. There is a median dorsal and ventral line which is free from calyces, narrow but evident. The diameter of the colony is 6.6 mm., and of the axis 3 mm. The calyces are thickly and evenly emplanted on all sides of the colony, except on the narrow median lines. Their arrangement is hard to make out, but they tend toward oblique rows of

eight or nine to the row, extending from the dorsal to the ventral median line. The basal portion of the colony is almost bare of calyces. 10 cm. from the base there are about 6 calyces to the row, although almost the greatest diameter of the colony is here attained.

The individual calyces are papillate projections directed distally, but with their adaxial sides appressed to the stem and their mouths turned directly towards the stem, so that they look like fleshy scales with flattened, semicircular free margins. They average about 2.2 mm. long and .8 mm. in diameter. Their distal ends are often somewhat furrowed longitudinally, but this is not constant. There are also often pronounced grooves which are vertical and appear on the sides of the calyces. These are sometimes so pronounced as to give the margin the appearance of being trilobed, the middle lobe being much the largest. The calyx opening proper is entirely concealed in the preserved specimens by being turned directly toward the stem, leaving merely a curved, slit-like opening between the outer calyx wall and the cœnenchyma of the stem. The inner or adaxial wall is very short and thin compared with the outer, and is entirely covered by the latter. The polyps are very small, resembling those of *Isis hippuris*. They are so strongly retracted and so difficult to separate from the mass of small spicules of the fleshy calyx that is is exceedingly difficult to ascertain their characters. The mass of retracted tentacles is bent at an angle with the basal part, the latter being at right angles to the axis and the former inclined toward it. The polyp body has its walls thickly strewn with small oval or lenticular spicules and clubs, the former being probably undeveloped clubs, some of which extend to the dorsal surface of the tentacles.

A section across the stem shows:

1. A layer of club-stars with their club ends directed towards, and forming the surface of the colony.
2. A very thick cœnenchyma filled with similar clubs in the outer portions intergrading with symmetrical double heads and double stars in the inner parts.
3. A series of small round openings of the primary water-vascular canals symmetrically disposed a short distance outside of the axis.
4. The axis cylinder, composed of a series of concentric lamellæ of calcareous matter alternating with horny layers within which is a practically solid core of calcareous matter.

A longitudinal section shows that the polyps communicate with the water-vascular canals by definite round openings rather regularly disposed in the walls of the canals.

Spicules. These are all very minute and symmetrical. Those of the superficial layer of the cœnenchyma are club-stars, showing a distal clavate end truly club-shaped, covered with thorny points directed distally. Below this spiny portion is a perfectly smooth shank of much less diameter. The proximal end of the spicule shows a number of radiating points forming a many-rayed star, or a head with numerous pointed rays symmetrically disposed on all sides. They intergrade with the double stars or double heads which pack the inner portions of the cœnenchyma. These are beautifully symmetrical, minute spicules with a many-rayed head at each end and a median perfectly smooth girdle. The outer spicules are yellow, while the

double heads are mostly colorless. Small oval or lenticular spicules are found on the polyp bodies and smaller ones in the tentacles. These intergrade with the club-stars, many of which are found in the polyp walls.

Color. The colony described is a coral red. The exterior of the axis is olive and the interior is white. Spicules yellow and white. Other specimens are yellow.

General distribution. The type locality is the Indian Ocean. It has also been reported, probably erroneously, from the West Indies. It seems to have a wide range in the East Indies.

This species is typically dichromatic, red and yellow colonies of apparently the same age and from the same station being found. Other specimens are nearly white, in alcohol. Still others are salmon color, and some are deep crimson.

A specimen about 5 cm. long from station 164 is found with others much larger. It has the calyces laterally disposed and resembles some of the so-called species described as new by previous writers. This intergrades completely with typical specimens as described above, and from the same station. There seems no doubt that a number of specific descriptions have been based on young specimens.

2. *Juncella gemmacea* (Valenciennes). Plate IV, figs. 1, 1 *a*.

Gorgonia gemmacea Valenciennes. Manuscript in coll. of Museum, Paris, (fide Wright and Studer).
Juncella vimen Valenciennes. Comptes rendus, XLI, 1856, p. 14.
Verrucella gemmacea Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 185.
Juncella gemmacea Kölliker. Icones Histiologicæ, 1865, p. 140.
Ellisella gemmacea Gray. Catalogue Lithophytes British Museum, 1870, p. 26.
Juncella gemmacea Klunzinger. Corallenthiere des Rothen Meeres, I, 1877—79, p. 53.
Juncella gemmacea Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 659.
Juncella gemmacea Ridley. Collection H. M. S. Alert, Alcyonaria, 1884, p. 346.
Juncella gemmacea Wright and Studer, Challenger Reports, the Alcyonaria, 1889, p. 158.
Juncella gemmacea Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 313.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 299. Lat. 10° 52′.4 S., 123° 1′.1 E. 34 meters.

Colony subflabellate in form, attaining a height of 25.5 cm. The first forking occurs 4.5 cm. above the base. Each of the resulting branches forks about 3.5 cm. above its origin. The whole colony is regularly dichotomous in its branching, branchings of the 10th order being attained. The average distance between forkings is perhaps 2 cm., although there is considerable variation in this respect. As in many other cases of dichotomous branching it is possible to regard the branchlets as all springing from one side of a sinuous branch. This is true in some but not all of the branches. The writer thinks it possible that *Juncella racemosa* Wright and Studer (Challenger Report, p. 159) is this species, and that these authors have taken this view of what I believe to be dichotomous branching.

The basal part of the stem is devoid of cœnenchyma, the axis being 3.2 mm. in

diameter. The largest branch is nearly round in section and 4.5 mm. in diameter. This diameter is fairly well maintained throughout the median portions of the colony. In general there is a tendency to a flattening of the branches, although this is due more to the median grooves, which extend in the mid-anterior and mid-posterior surfaces of all of the branches, than to any real flattening of the branches. The terminal twigs are from 2.8 cm. to 7 cm. in length. The calyces are evenly and thickly distributed on all sides of the branches except along the narrow but evident median lines, resembling in their distribution those of species of *Eunicea*, for instance; being so closely packed as to be usually contiguous. In some places they show a strong tendency to an arrangement in spirals or oblique rows. On twigs they are arranged in oblique rows of three or four on each side.

The individual calyces are stout club-shaped, with their distal swollen portions abruptly bent toward the branch and their apertures facing the latter. A typical one measures a trifle over 2 mm. in height and 1.3 mm. in its greatest diameter. The adcauline wall is less than 1 mm. in height. In lateral view a slight appearance of lobulation of the margins is seen. The tentacles are armed with small club-shaped spicules.

A cross section of the axis shows much the same features as in *J. juncea*, except that there is a less symmetrical and regular alternation of calcareous and horny rings, the appearance being more like that of the outer portions of the axis of *Plexaurella*.

Spicules. These are mainly of two sorts, which however intergrade. 1st a double headed spicule with one head like a many-rayed star and the other oval or almost equally round, but with distally directed imbricating spines. These intergrade completely with typical double stars, much less numerous than the double heads.

Color. The colony is a light tan, or yellowish brown.

General distribution. The type locality is the Red Sea. Also reported from Ceylon and the Indian Ocean.

3. *Juncella racemosa* Wright and Studer.

Juncella racemosa Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 159.
Juncella racemosa Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 268.

Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 310. 8° 30′ S., 119° 71′.5 E. 73 meters.

Colony subflabellate, straggling in habit, 38 cm. in height, branching dichotomously. The first forking is 7 cm. above the base. The main stem is mostly decorticated and has a diameter of 3,3 mm. The branches are dichotomous, or unilateral according to interpretation [1],

[1] It seems to the writer that there is much confusion over this point. He would call the branching unilateral when the main branch is straight (not undulating) and bears branchlets on one side only. When the main branch is regularly undulating and sends forth branches from the knees of the undulations the branching is dichotomous.
As a good illustration of the former *Ctenocella* may be cited, while the present species is an excellent illustration of the latter.

branchings of the fifth order being sometimes attained. The distance between branches varies from 5.5 cm. to 3.5 cm. thus averaging much more than in the preceding species. The terminal twigs are much longer, reaching a length of 16 cm. The diameter of the branches varies from 3 mm. to 2 mm. near tips of branches. The median grooves are evident on the proximal parts of the colony, but are almost obliterated on the distal parts. The calyces are emplanted on all sides of the branches, and are in oblique rows of 3 to 5, although the rows are often obscured by younger calyces being intercalated between the older and larger ones. In some places the calyces on one side of the branch are inclined upward, while those on the other side are inclined downward; but this is exceptional.

The individual calyces are club-shaped, prominent, with their distal ends enlarged and inclined toward the branch. The aperture seems in general to be more strictly terminal than in other species and less inclined to face the branch. This, however, may be largely due to the stage of contraction of the polyp. A typical calyx measures 1.6 mm. in length and 1.2 mm. in diameter. There is a slight appearance of lobulation around the margin. The dorsal surfaces of the tentacles are armed with small, often bar-like spindles transversely disposed.

A cross section of a branch shows that the cœnenchyma is rather thick and the axis is composed of many concentric and interrupted rings of calcareous and horny material alternately disposed. The water-vascular canals are symmetrically disposed arround the axis, but some distance outside of it.

Spicules. These are of two kinds characteristic of the genus. The club-stars have the club ends more slender, as a rule, than in the last species, and simple clubs are rather common. Typical double stars are rare. Double crosses are also found, as well as an occasional simple spindle.

Color. The colony is a bright coral red throughout. The polyps are white.

General distribution. Type locality off Japan, 345 fathoms. This species is also found in the Indian Ocean.

The specimens referred to this species are identified with some doubt, but the one described agrees fairly well with the original description, particularly as regards spiculation, manner of growth and the calyces.

Thomson and Simpson regard *Juncella miniacea* as a synonym for this species.

4. *Jucella sanguinea* new species (Plate V, figs. 1, 1 *a*; Plate X, fig. 4).

Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 meters.

Colony (incomplete) subflabellate in form and attaining a height of 37.5 cm. The specimen consists apparently of one of the main branches of a much larger colony. The branching is partly dichotomous and partly irregular. The main stem, or branch, is 4 mm. in diameter and its first forking is 3.5 cm. above its base. The resultant branches are quite irregular, the smaller one giving off branchlets from the outer side only, while the larger one is dichotomously

branched. The distance between branchings is from 6.8 cm. to 9 mm. (on distal parts). The polyps are regularly and thickly emplanted on all sides of the branches, there being but a slight indication of median grooves on the anterior and posterior surfaces; but more thickly on the distal than on the proximal parts of the colony. They are arranged in somewhat irregular diagonal rows of about four to each row, reaching from back to front of the colony.

The individual calyces are much as in the last species, being club-shaped with their openings turned toward the branch and often pressed against it. A typical calyx measure 2.8 mm. in height and 1.3 mm. in greatest diameter. The adcauline wall is about 1.3 mm. long, the calyx being less extensively appressed to the branch than in *J. gemmacea*. The oral end shows a small central aperture surrounded by eight rather shallow lobes. I am unable to detect any spicules on the tentacles.

A cross section of the axis near the base shows a distinct difference from other species of the genus examined. There is no central core of homogenious consistency, but the whole axis is made up of interwoven calcareous and horny material, very much as is represented by KÖLLIKER in his figure of the axis of *J. gemmacea* [1].

Spicules. These are much as in the last species, being almost exclusively of two types, the most common being double heads or rather club-stars according to the nomenclature adopted in this work. The second form is a typical double star. I can find no true spindles except some very minute ones which I suppose to be young spicules.

Color. The colony is deep crimson throughout. The axis has an olive green cast and the polyps are white.

This species is closely allied to *J. gemmacea*. It differs, however, in being more robust in habit, in the size and shape of the calyces, in having no tentacular spicules, and in color. This last character, however, would not, alone, be a sufficient one to justify us in regarding it as distinct. It differs from *J. racemosa* in size of calyces and in the character of the spicules.

Note on the genus **Scirpearea.**

The writer has already (p. 5) given his reasons for regarding this genus untenable. He is further of the opinion that the species heretofore included in *Scirpearea* could be acommodated in other genera. Some of these species could be placed in *Juncella*, and such species as *Scirpearea furcata* Hickson [2] could go into the genus *Scirpearella* as defined by WRIGHT and STUDER.

Genus **Scirpearella** Wright and Studer.

Scirpearella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 154.
Scirpearella Délage et Hérouard. Traité de Zoologie Concrète, Tome II, 2me Partie, 1901, p. 429.

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[1] Icones Histiologicæ, II, 1865, plate XIV, fig. 4.
[2] Alcyonaria of the Maldives, II, 1905, p. 822.

The original definition of this genus is as follows:

"Colony simple or very feebly branched. Axis calcareous, brittle, smooth or symmetrically grooved on the surface. Polyps arranged in spirals or sometimes in rows on the stem; tentacles and upper portion of the polyps retractile within prominent verrucæ. Cœnenchyma moderately thick, with spiny spindles and double clubs forming a roughened outer layer".

The mode of branching does not seem to be a good generic character in this group, and is not available for this genus. The spicules, according to the figures given by WRIGHT and STUDER (Plate XXXIV, figs. 5, 6, 7 and 8) are seldom true double clubs. This is also true of the species in the Siboga collection. The forms called "double clubs" by WRIGHT and STUDER would be called double heads by the present writer who would define the genus as follows:

Gorgonellidæ which are variously branched, but in no known case reticulate. Calyces arranged in spirals or oblique rows in adult colonies, but opposite in young colonies, low verrucæ or domes capable of retracting with the polyps. Spicules mostly double heads and girdled spindles, but simple spindles and a few clubs are also found.

The type of this species is *Scirpearella profunda* Wright and Studer. Other known species are *Scirpearella aurantiaca* Thomson and Henderson, *S. divisa* Thomson and Henderson, *S. gracilis* Wright and Studer, *S. indica* Hickson, *S. moniliformis* Wright and Studer, *S. rubra* Wright and Studer, *S.* (*Scirpearea*) *furcata* (Hickson) and the new species described beyond.

1. *Scirpearella rubra* Wright and Studer (Plate VI, figs. 1—5).

Scirpearella rubra Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 157.

Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.
Stat. 80. 2° 25′ S., 117° 43′ E. 50—40 meters.
Stat. 91. Muaras Reef, inner side, East coast of Borneo. Up to 54 meters.
Stat. 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 meters.
Stat. 204. 4° 20′ S., 122° 58′ E. From 75 to 94 meters.
Stat. 240. Banda Anchorage. 9—45 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony an unbranched stem (incomplete) 125 cm. long. Diameter near proximal end 6 mm., near distal end 4 mm., near middle 7 mm. The calyces are arranged in more or less regular spirals around all sides of the stem, there being usually from seven to ten calyces in a spiral, a little more than 2 mm. apart on the average. Proximally they are much more distant, distally somewhat more closely approximated. Near the distal end one side of the colony shows a rather broad bare band, but this is not evident on most of the stem. On the proximal part there is a tendency to show two such bands, frequently invaded however, on opposite sides of the colony.

The individual calyces are in the shape of a reversed horn or curved cone, the summit being curved upward and the opening being directed upward, or upward and a little outward. A typical calyx measures 2.7 mm. in height and 2.8 mm. in diameter at base. Near the distal end it has a diameter of 1.4 mm. and the walls on the distal portion show faint indications of eight streaks of reddish against the lighter distal parts of the wall. The walls are crowded with vertically disposed spicules, most of which seem to be tuberculate spindles. The dorsal surfaces of the tentacles bear transversely disposed spindles. There are also short stout spindles in the lower portion of the mesenteries, usually vertically placed. Very large ova were found attached to four of the mesenterial filaments.

A cross section of the stem shows a moderately thick cœnenchyma. The axis cylinder is much like that of *Juncella*, with a comparatively dense core showing but slight evidence of concentric lamellation, and an outer envelope composed of concentric layers of horny and calcareous matter. The water-vascular canals are regularly disposed around the axis and their walls are filled with stout double clubs.

Spicules. By far the most common form is the densely tuberculate double head. Occasionally these take the form of very stout crosses through longitudinal division of the heads. The next most common form is the regular spindle, found mainly in the polyps themselves. Sometimes these have regular whorls of verrucæ, but they are usually stout, with irregularly disposed warts. Clubs are rarely seen.

Color. The colony is coral red, as are also the polyps. Other colonies are creamy white.

General distribution. Type locality. Hyalonema Ground, off Japan, 345 fathoms.

A large series of this species makes it possible to determine that the young specimens may be of either color. In these the calyces are lateral and usually opposite.

These intergrade with typical colonies, sometimes from the same station. Several specimens are slightly branched.

2. *Scirpearella gracilis* Wright and Studer. (Plate VII, figs. 1—5).

Scirpearella gracilis Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. 156.

Stat. 58. Bay of Nangamessi, Sumba. Up to 36 meters.
Stat. 166. 2° 28′.5 S., 131° 3′.3 E. 118 meters.
Stat. 204. 4° 20′ S., 122° 58′ E. 75—90 meters.
? Stat. 208. 5° 39′ S., 122° 12′ E. 1886 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 meters.

Colony originally forked, but with one branch missing. 44.5 cm. in length. Main stem to fork 4.4 cm. long, 3.5 mm. in diameter, and devoid of calyces. Main branch devoid of calyces for 13.5 cm., 3.5 mm. in diameter near base and diminishing to 3 mm. near distal end. There is a shallow but distinct groove running along one side of the colony, and that

side is less thickly emplanted with calyces than the other and there is a distinct tendency toward a bare band on either side of the groove. The calyces are thus on three sides of the stem, where they often tend to a spiral arrangement, there being usually four calyces in each oblique row from the impressed line on one side around to the one on the other. On the distal part of the colony there are two opposite grooves, each in the centre of a distinct band devoid of calyces. Here there is a double row of calyces on each side. Another fragment in the same bottle appears to be the distal end of the branch just described. It is 32 cm. long. It is therefore probable that this colony was originally 76.5 cm. long, tapering to a very fine, slender end.

The individual calyces are subconical or rather truncated cones, rather low and broad. A typical one measures 1 mm. in height and 1.9 mm. in diameter at the base. The tentacles bear spicules, mostly double spindles, thickly encrusted over their basal portions.

Spicules. These are almost exclusively double heads and girdled spindles (double spindles?) They are all densely tuberculate. Heavy fusiform spicules are formed when the depressed girdles are obliterated by the invasion of tubercles. The double heads and girdled spindles intergrade in every possible degree. Regular spindles, such as are common in *S. rubra*, are almost never seen. Small crosses formed of four tuberculate heads joined by a cross-shaped smoother part, are rather common, the four heads being so close as to be often contiguous. I find no clubs.

Color. The colony is light grayish brown throughout, with a tinge of olive.

General distribution. Type locality. Off New Hebrides. 130 fathoms.

A young specimen from station 289 is 22.5 cm. long, very slender, with a length of 9 mm. without calyces, and 15 mm. with calyces. The calyces are lateral and regularly alternate, averaging about 2.3 mm. apart. In form they are low cones with rounded summits which are directed outward. The spicules are as in the specimen described above. Another specimen from the same station has lateral calyces which appear much more prominent on account of the partial expansion of the polyps. It also shows a faint median impressed line. A specimen taken from station 208, depth 1886 meters agrees quite well with young specimens from station 260 (90 meters) and 204 (94 meters).

It is altogether likely that some of the so-called species of this genus that have been described as specifically distinct and are listed on page 24 are based on young specimens of this form.

3. *Scirpearella regia* new species. (Plate VIII, figs. 1, 1*a*; Plate X, fig. 5).

Stat. 172. Gisser; anchorage between this Island and Ceram-Laut. 18 meters.

Colony (dried) an enormous bushy mass profusely branched in a dichotomous manner, 134 cm. in height. The base is a rudely hemispherical mass embracing corallines, wormtubes etc., 19 cm. in diameter and 8 cm. high. The stem is 2.1 cm. in diameter at its base, bears

a stub of a branch 4 cm. from its proximal end and bifurcates about 12 cm. from its base. The main branches bifurcate 10.5 cm. above their origin and continue to divide dichotomously until branchings of the 8th order are attained. The ultimate twigs are very long and slender, sometimes 60 cm. long, with an average diameter of 3.5 mm. The branches and twigs are all erect and proximately parallel, and are very numerous, there being considerably over 100. The cœnenchyma is thin, and the main branches are without calyces and often denuded of cœnenchyma. The calyces are distributed on all sides of the smaller branches and twigs. There is no evidence of a median groove in the dried specimen, and the calyces are so shrunken in the type that they can not be studied in a satisfactory manner. At the distal ends of the twigs the cœnenchyma is so shrunken that a cross section is sometimes triangular and sometimes quadrangular.

A cross section of a small branch shows a rather thin cœnenchyma, regularly disposed primary water-vascular canals and axis with a hard amorphous core of limestone and an outer relatively thick investment of concentric layers of partly calcareous and partly horny material.

Spicules. These are mostly densely tuberculated double heads with the girdle usually quite well marked and seldom entirely obliterated. These intergrade with girdled spindles, double crosses, etc. Regular Greek crosses are also seen, but the most common form, next to the double head, is the double cross. Simple spindles and clubs are rarely seen.

Color. The dried colony is a rather light reddish brown or terra cotta. It was probably bright red in life. The spicules are an orange yellow.

This is by far the largest gorgonellid in the collection, and must have been a truly magnificent specimen when alive.

4. *Scirpearella hemispherica* new species. (Plate V, figs. 2 and 2*a*; Plate X, fig. 6).

Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.

Colony unbranched, 18 cm. in height. The basal part of the stem is devoid of calyces and is 2.2 cm. in diameter. 5 cm. from its base the colony seems to have been forked and one of the braches broken off short. Above this point the stem is bare for 2.6 cm., and but 1.2 mm. in diameter across the polypiferous portion. The calyces are very irregularly but rather closely scattered on all sides of the stem with a tendency toward a more compact arrangement on the sides.

The individual calyces are regularly hemispherical or dome-shaped, varying greatly in size. One of the larger ones is 1.7 mm. in height and 2.3 mm. in diameter at its base. They are so completely closed by the strong contraction of the polyps that the openings are seen with difficulty, but appear to be somewhat inclined toward the distal end of the colony. The distal end of the polyp body is filled with a mosaic of spicules in the form of double heads and double spindles, and these run out over the basal portions of the tentacles in broad bands which appear conspicuously on the tentacles after the polyp has been dissected away from the calyx, the red spicules contrasting with the yellowish polyp.

Spicules. Practically all of the spicules are very densely tuberculated double heads with the girdles very narrow and often obliterated so as to produce an oval form compactly covered with very closely aggregated verrucæ. Spindles are very rarely seen, and these are probably from the polyps.

Color. The colony is coral red, the part of the stem which bears no calyces is dull pink. The axis is light yellowish and the polyps yellow.

This species appears to be clearly distinct from the others in the collection, and I am unable to identify it with any of the described forms. The shape of the calyces, although often not very reliable specific characters, seems to be quite characteristic in this case. The spiculation of the polyps also furnishes a good character. It is probably nearest *S. gracilis*; but that species seems constant is color, no red specimens having been found.

Genus **Nicella** Gray.

Nicella Gray. Catalogue Lithophytes in the British Museum, 1870, p. 40.
Nicella Studer. Versuch eines Systemes der Alcyonarien, 1887, p. 67.
Nicella Wright and Studer. Challenger Reports, the Alcyonaria, 2889, p. LXV.

STUDER (1887) gives the only satisfactory definition of this genus that I have been able to find. The following is a translation:

"Stem upright, branched, with thin cœnenchyma and exserted calyces which stand vertically and have their ends truncated. Calyces lateral on stem and branches, leaving a median space bare. The spicules form an outer layer of small double clubs and an inner layer of longer cylindrical or spindle forms, thickly covered with verrucae".

WRIGHT and STUDER (1889) give practically the same definition as the one quoted above.

With the single change of the words "double clubs" to "double heads" the definition as given by STUDER can stand as acceptible for our present purpose.

The type of this genus appears to be *Nicella dichotoma* (Gray)[1]. But two other species of the genus seem to have been described, i. e. *Nicella pustulosa* and *N. reticulata*, both by THOMSON and SIMPSON. It seems, however, from the descriptions and figures, that neither of these species can be regarded as belonging to this genus as defined by STUDER.

1. *Nicella coralloides* new species. (Plate IX, figs. 2, 2*a*; Plate XI, fig. 1).

Stat. 117. 1° 0'.5 N., 122° 56' E. 80 meters.
Stat. 257. Duroa Strait, Kei Islands. Up to 52 meters.

Colony flabellate in form, 11 cm. in height and with a spread of 9.5 cm. The base is wanting, and also one large branch. The main stem is 1.8 cm. long to where it forks, and one of the resultant branches is broken off. Diameter of stem about 2 mm. The main branch

[1] This species, according to WRIGHT and STUDER, was originally named *Scirpearea dichotoma* Gray and afterward changed by the original describer to *Nicella mauritiana* Gray. This proceeding would not be considered allowable under our present rules of nomenclature, and therefore the species should, in my opinion, be *Nicella dichotoma* (Gray).

is curved in the shape of a sickle and sends off a number of secondary branches which again divide in an irregularly alternate manner and often fork distally, the ultimate branchlets being short, rarely exceeding 1.5 cm. in length. The distance between secondary branches averages about 5 mm. There is no evident keel or groove in the median line, although it is indicated in places. The calyces are lateral and alternate in position, and are usually about 1.5 mm. apart.

The individual calyces are cylindrical in form and are projected nearly at a right angle with the branch, although they tend to be distally inclined. A typical calyx measures 1.3 mm. in height and 1.1 mm. in diameter. The basal end is usually somewhat broader than the distal. The margin is surrounded by eight lobes which are continuous with the bases of the tentacles. These lobes are not so distinct as in the next species.

The tentacles are very thickly encrusted with a mosaic of bar-like spicules, and similar spicules are placed vertically in the body wall of the polyp.

A cross section of a branch shows a relatively thin cœnenchyma and a regular series of water-vascular canals which, in a large branch, is separated from the axis by a thin layer of cœnenchyma. The axis is calcareous, without lamellæ of horny material.

Spicules. As in the next species, these are of two kinds, an outer layer of small double heads and an inner layer of much larger bar-like forms with rounded corners and a densely and finely tuberculate surface. This species differs from the next, however, in having the girdles almost always obliterated in these bar-like forms, although it is occasionally seen in what are probably immature spicules.

The double heads sometimes become double stars, and the bar-like forms sometimes intergrade with slender spindles.

Color. The colony is a bright coral red; the polyps are white, but may originally have been yellow. The axis is greenish.

Other specimens from the type locality have verruciform calyces. This is probably due to the fact that the calyces partake of the retraction of the polyps. Another specimen is very large, broken, the largest fragment being 25 cm. long.

2. *Nicella carinata* new species. (Plate IX, figs. 1, 1 *a*; Pl. XI, fig. 2).

Stat. 117. 1°0′.5 N. 122°56′ E., 80 meters. (Type).
Stat. 154. 0°7′.2 N., 130°25′.5 E. 83 meters.
Stat. 213. Saleyer Anchorage and surroundings, including Pulu Pasi Tanette, near the North point of Saleyer Island. Up to 36 meters.
Stat. 257. In Duroa Strait, Kei Islands. Up to 52 meters. (Type).
Stat. 260. 5°36′.5 S., 132°55′.2 E. 90 meters.
Stat. 305. Mid Channel in Solor Straits, off Kampong Menanga. 113 meters.

Colony very profusely branching, irregular in form, but tending to form a sub-flabellate structure. The base is absent, and the main stem is branched about 7.5 cm. from its proximal end. It is about 3.1 cm. in diameter, round in section and ascends in a feebly geniculate manner giving off branches alternately to the right and left. These branches are sometimes

fairly straight and at others tortuous, and give off branchlets which tend to an alternate arrangement and rebranch until branchings of the 6th order are sometimes attained. The front and back of the branches are devoid of calyces and often show a median longitudinal ridge or keel. The distance between branches varies greatly, but will average perhaps 8 mm. The tips of the twigs bear a pair of nearly opposite calyces with a blunt point between them indicating the end of the axis. Calyces regularly alternate.

The individual calyces are quite prominent for this group, cylindrical in form and regularly alternate in position. They are directed outward, upward and slightly forward or toward the front of the colony. A typical calyx measures 1.6 mm. in height and 1.3 mm. in diameter. They are often slightly longer in the distal parts of the colony. The walls show a tendency to form eight longitudinal ridges or corrugations on the distal parts. The margin is eight-lobed and the bases of the infolded tentacles are very prominent, forming a radiate mass, the intervals between the tentacles showing as a star-like figure. The tentacle bases are heavily spiculated, mostly with double heads similar to those on the calyx walls and general cœnenchyma. They encrust the dorsal surface of the tentacles well to the distal end. The cœnenchyma is rather thin and the axis is calcareous without evident lamellæ of chitinous matter.

Spicules. These are very characteristic and consist mainly of two forms; 1st an outer layer of minute double heads, densely tuberculate; 2nd an inner and thicker layer of spicules which differs from any others that I have seen aside from this genus. They are much larger than the double heads, and bar-like in outline. The bars are somewhat narrowed at the ends and have their corners rounded, although the ends are fairly square. Their surface is very finely and densely tuberculate, so that the actual surface of the spicule is almost completely hidden except for the median girdle which is usually sharply cut but sometimes obscured or completely obliterated. Almost all of the spicules are one or the other of these two forms. Rarely minute crosses are seen and very rarely minute regular spindles.

Color. The colony in general is yellowish golden brown; the polyps very dark brown or chocolate, a most unusual color, which is quite conspicuous when the polyps are dissected out. None were expanded in the specimen described.

This species is a typical *Nicella* according to the original definition by Gray, and demonstrates the validity of the genus.

In a specimen from Station 257 the calyces are more crowded and proportionally shorter, and grayish in color, as if bleached. A small specimen from station 260 has the calyces much more distant than in the type, and is grayish brown in color.

Genus **Ellisella** Gray (modified by Studer).

Ellisella Gray. Proceedings Zoological Society of London, 1857, p. 257.
Ellisella Gray. Catalogue Lithophytes British Museum, 1870, p. 25.
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Ellisella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.

Studer (1878) defines the genus as follows:

"Stamm einfach oder gabelästig, Warzen kaum vorspringend, in zwei Reihen seitlich am Stamm angeordnet. In der Rinde nur dopple Keulen und Spindeln".

The same author (1887) gives a slightly extended definition, translated as follows:

"Colony simple, or with forked branches, thick cœnenchyma and scarcely developed calyces which are arranged in two rows. Cœnenchyma contains double clubs and spindles".

This definition is practically repeated by Wright and Studer (1889) since which time it has apparently received no further definition. Studer's last definition may therefore stand as the one here adopted, with the understanding that the "Dopple Keulen" of that writer be interpreted as "double heads" according to the system here used.

The type of this genus appears to be *Ellisella elongata* (Pallas). Other species are *Ellisella calamus* Studer, *E. maculata* Studer, and the single species secured by the Siboga Expedition.

1. *Ellisella flava* new species (Plate IX, fig. 4, 4*a*; Plate XI, fig. 3).

Stat. 117. 1°0′.5 N., 122°56′ E. 80 meters.

Colony fragmentary, the largest piece being 6.5 cm. long, dichotomously branched twice, the first forking being immediately above the proximal end of the specimen. One of the resultant branches is simple and is 4.1 cm. long. The other branch forks 3.7 mm. above its origin, the resulting branchlets being simple, the longer 2.6 mm. and the shorter 1.4 cm. long. The branches are slender with a comparatively uniform diameter of .7 mm. There is a clearly defined furrow along the front of the branches. The calyces are disposed on two opposite sides of the branches, in some places being regularly opposite in position and in others being irregular. The former, however, seems to be the normal arrangement.

The individual calyces are very low subconical verrucæ appearing as mere swellings along the sides of the branches. A typical calyx measures 1.1 mm. in its longer diameter (being oval in section) and .6 mm. in height. The margin is feebly marked with eight lobes. The calyx walls are filled with regular spindles which are vertically disposed on the distal parts and point toward the margin. Similar spindles encircle the basal parts and are longitudinally disposed in the cœnenchyma of the branches. The tentacle bases are thickly encrusted with smaller spindles disposed longitudinally, as a rule. On the distal parts of the tentacles there is a dorsal band of small transverse spindles.

The cœnenchyma is comparatively thin and the axis is hard, white and calcareous.

Spicules. The spicules of this form do not have the general facies of the spicules of the Gorgonellidæ at all. The most common form by far is the tuberculate spindle, terete in form and almost never with a distinct girdle. The tuberculation is usually quite dense, so as to hide the actual surface of the spicule. There are also a few clubs, crosses, small irregularly branched forms and, very rarely, double heads.

Color. The colony, in alcohol, is rather bright yellow.

Were it not for the calcareous axis, without joints, the writer would hardly suspect this species of belonging to the Gorgonellidæ. It seems to fit better in the genus *Ellisella* than in any other, although the practical absence of double clubs is not in accord with the definition adopted for that genus.

Genus **Plumigorgia** new genus.

Colony bearing symmetrically disposed, delicate, pinnately arranged ultimate branchlets, greatly resembling a plumularian hydroid. Calyces minute. Spicules very minute, oval lenticular and disk-shaped forms embedded in a translucent horn-like cœnenchyma from which it is difficult to separate the spicules.

1. *Plumigorgia hydroides* new species. (Plate IX, fig. 3, 3*a*; Plate XI, fig. 4).

Stat. 96. Southeast side of Pearl Bank, Sulu Archipelago. 15 meters.
Stat. 123. North Bay, Biaru Island. 36—27 meters. (Type).

Colony straggling in form, branches truly pinnate, greatly resembling a plumularian hydroid; total height 13.7 cm. The colony arises from an irregularly calcareous mass. The main stem is 2 mm. in diameter near its base and forks 2.8 mm. above its origin. The main branches are stiff and tortuous, most of their branchlets being broken off, but their stubs show that they were rather regularly alternate, at least on the distal parts of the colony. The ultimate branchlets are regularly alternate offshoots from the secondary branches, and are gracefully curved exactly as are the hydrocladia in a plumularian. The ultimate twigs are about 3.5 mm. apart and attain a length of 13 mm. The axis in these branchlets is exceedingly attenuated, being at the ends no larger than a hair, and is calcareous throughout. The calyces are all lateral, but are otherwise irregularly disposed, being opposite, subopposite or alternate in different parts of the same twig.

The individual calyces are very minute for alcyonarians, a typical one being less than .5 mm. in height and about as wide as high. They vary in shape, some being dome-shaped and others in the form of short cylinders. Their walls are full of minute disk-shaped or biscuit-shaped spicules. These are embedded in the cœnenchyma in a peculiar manner, not being contiguous, but distinctly spaced as if stuck in a horn-like translucent cœnenchyma, each spicule being distinctly isolated from its fellows. This horn-like matrix is peculiar in that it resists boiling in a potash solution and comes off from the axis like a transparent pellicle with the spicules still firmly embedded. An end view of a calyx shows that the aperture is very small, when the polyp is retracted, and the margin is surrounded by eight not very strongly marked lobes. The tentacles have very long and slender pinnules and their dorsal surfaces are packed with minute disk-like spicules which are even smaller than those in the calyx walls and cœnenchyma.

Spicules. These are of two forms which are really but modifications of one. They are all lenticular or disk-shaped. Often the oval is constricted in the middle and thus a biscuit

form is produced. Their surfaces are all covered with fine granules which are much smaller than verrucæ. None of them are girdled and the granules are so thick that the spicules are not translucent.

Color. The whole colony is creamy white.

A number of specimens from Station 96 were preserved in formalin and the spicules were exceedingly hard to demonstrate. A few, however, were found and proved to be of the same peculiar forms as described above.

Genus **Isidoides** new genus.

Axis solidly calcareous; calyces club-shaped; spicules comparatively large bar-like forms with the ends swollen and the surface comparatively smooth, without evident verrucæ. The operculum is composed of eight segments, each consisting of a plate formed of adherent longitudinally disposed bars.

1. *Isidoides armata* new species. (Plate VIII, figs. 2, 2*a*; Plate XI, fig. 5).

Stat. 267. 5° 54′ S., 132° 56′.7 E. 984 meters.

The specimen is fragmentary, the largest fragment being straggling in form, 15 cm. high and with the base lacking; although it is partly retained in another, where it is solidly calcareous. The main stem, or branch, forks 5 cm. from its base, one of the resulting branches being broken off 3 cm. from its base and the other forming practically the entire specimen. This latter is denuded to its first lateral branchlet 4.4 cm. from its origin. 1.1 cm. above this branchlet another arises on the same side which forms the main part of the specimen and is about 8.6 cm. long. It bears one terminal simple twig on one side and two on the other. The axis is solidly calcareous, round, 1.5 mm. thick at its base. The calyces are almost all lateral in position on the main branches, but may be on all sides of the distal parts of the twigs. They are irregular in distribution, averaging about 2 mm. apart.

The individual calyces vary greatly in size and shape according to age and stage of contraction of the polyps. Ordinarily they are tubular when retracted and club-shaped when expanded, but the distal ends are almost always enlarged, even in retraction. A typical calyx with retracted polyp measures 1.8 mm. in height and 1.4 mm. in diameter near its distal end. One with the polyp partly expanded is 4 mm. high and 1.5 mm. in diameter. The calyx walls are packed with comparatively large, bar-like or lenticular spicules which are criss-cross but show a tendency to be vertical when the polyp is expanded and horizontal, especially near the margin, when the polyp is retracted. The tentacles are closely folded over the oral disk and their dorsal surfaces are heavily armed with longitudinally disposed bar-like spicules like those in the calyx walls. These completely cover the dorsal surface with an imbricating series, the distal ends of some overlapping the basal ends of others, and are adherent to each-other so that the whole pseudo-operculum is made up of eight segments, each covering one tentacle with an adherent mass of overlapping bar-like spicules.

Spicul'es. These are all of the bar-like form, the bars often being somewhat expanded distally. Their ends are evenly rounded and their surfaces are quite smooth showing merely a very fine, dense, granulated appearance under moderately high powers of the microscope. Their profiles are smooth, not showing verrucæ or points of any size. They resemble in form certain spicules found in the Isidæ, e. g. *Bathygorgia profunda,* but are smoother than any others that the writer has seen.

Color. The colony is very light brown and the axis is the same.

This remarkable form shows a close resemblance to certain Isidæ, and would be placed in that family were the axis jointed. It also shows an approach to the Primnoidæ in the character of the operculum.

DISTRIBUTION OF THE GORGONELLIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Gorgonellidæ were secured, together with the depth and character of the bottom; and the species collected at each Station.

STATION 47. Bay of Bima, near South Fort. 55 meters. Mud, with patches of fine coral sand. *Verrucella flaviflora.*

STATION 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand and shells, according to locality. *Gorgonella rigida, Juncella juncea.*

STATION 53. Bay of Nangamessi, Sambu. Up to 36 meters. Coral sand, mud near shore. *Scirpearella gracilis.*

STATION 60. Haingsisi, Samau Island near Timor. 23 meters. *Juncella juncea, Scirpearella rubra, Scirpearella hemispherica.*

STATION 66. Bank between Islands of Bahuluwang and Tambolungan, south of Saleyer. Dead Coral, Halimeda, Lithothamnion. 8 to 10 meters. *Juncella juncea.*

STATION 80. 2° 25′ S., 117° 43′ E. Borneo bank. From 40 to 50 meters. Fine coral sand. *Scirpearella rubra.*

STATION 91. Muaras Reef, inner side; East coast of Borneo. Up to 54 meters. Hard coral sand. *Scirpearella rubra.*

STATION 96. Southeast side of Pearl Bank, Sulu Archipelago. 15 meters. Lithothamnion bottom. *Plumigorgia hydroides.*

STATION 99. 6° 7′.5 N., 120° 26′ E. North Ubian, Sulu Archipelago. 16—23 meters. Lithothamnion. *Juncella racemosa.*

STATION 117. 1° 0′.5 N., 122° 56′ S. Kwandang Bay entrance, Celebes. 80 meters. Sand and coral. *Nicella coralloides, Nicella carinata, Ellisella flava.*

STATION 123. North Bay, Biaru Island. 36—27 meters. Stone and Lithothamnion bottom. *Plumigorgia hydroides.*

STATION 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand. *Scirpearella rubra.*

STATION 154. 0° 7′.2 N., 130° 25′.5 E. 83 meters. Grey muddy sand, shells and Lithothamnion. *Nicella carinata.*

STATION 162. Between Loslos and Broken Islands, West Coast of Salawatti. 18 meters. Coarse and fine sand, with clay and shells. *Juncella juncea.*

STATION 164. 1° 42′.5 S., 130° 47′.5 E. near New Guinea. 32 meters. Sand and stone mixed with mud. *Juncella racemosa, J. juncea, Scirpearella rubra.*

STATION 166. 2° 28′.5 S., 131° 3′.3 E. near Misool. 118 meters. Hard coarse sand. *Scirpearella gracilis.*

STATION 172. Gisser, anchorage between this Island and Ceram-Laut. 18 meters. Coral and Lithothamnion bottom. *Scirpearella regia.*

STATION 204. 4° 20′ S., 122° 58′ E. Buton Strait. 75—94 meters. Sand with dead shells. *Gorgonella umbraculum, G. rigida, Scirpearella rubra, S. gracilis.*

STATION 208. 5° 39′ S., 122° 12′ E. Banda Sea. 1886 meters. Solid green mud. *Scirpearella gracilis.*

STATION 213. Saleyer Anchorage and surroundings, including Pulu Pasi Tanette, near the North point of Saleyer Island. Up to 36 meters. *Nicella carinata.*

STATION 240. Banda Anchorage. 9—45 meters. Black sand. Coral. *Funcella juncea, Scirpearella rubra.*

STATION 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters. *Funcella juncea.*

STATION 257. In Duroa Strait, Kei Islands. Up to 52 meters. Lithothamnion, sand and coral. *Gorgonella delicatula, Nicella coralloides, N. carinata.*

STATION 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Funcella juncea, F. racemosa, F. sanguinea, Scirpearella rubra.*

STATION 260. 5° 36′.5 S., 132° 55′.2 E. Near Kei Islands. 90 meters. Sand, coral and shells. *Gorgonella rigida, Funcella racemosa, Scirpearella rubra, S. gracilis, Nicella carinata.*

STATION 267. 5° 54′ S., 132° 56′.7 E. Gray mud with brown upper layer. 984 meters. *Isidoides armata.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands, (Pearl Banks). 13 meters. Sand and shells. *Ctenocella pectinata, Funcella juncea, F. gemmacea.*

STATION 274. 5° 28′.2 S., 134° 53′.9 E. near Aru Islands. 57 meters. Sand and shells, stones. *Gorgonella orientalis, Scirpearella gracilis.*

STATION 282. 8° 25′.2 S., 127° 18′.4 E. Anchorage between Nusa Besi and the N. E. point of Timor. 27—54 meters. Sand, coral and Lithothamnion. *Funcella juncea.*

STATION 289. 9° 0′.3 S., 126° 24′.5 E. South coast of Timor. 112 meters. Mud, sand and shells. *Scirpearella gracilis.*

STATION 299. 10° 52′.4 S., 123° 1′.1 E. Buka or Cyrus Bay, South coast of Rotti Island. 34 meters. Mud, coral and Lithothamnion. *Ctenocella pectinata, Funcella gemmacea, F. sanguinea, Scirpearella gracilis.*

STATION 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters. Stony. *Gorgonella orientalis, G. rigida, Scirpearella rubra, Nicella coralloides, Nicella carinata.*

STATION 306. 8° 27′ S., 122° 54′.5 E. near Flores. 247 meters. Sandy mud. *Gorgonella orientalis.*

STATION 310. 8° 30′ S., 119° 7′.5 E. Flores Sea. 73 meters. Sand, dead coral. *Gorgonella orientalis, Verrucella rubra, V. stellata, Funcella juncea, F. racemosa, Scirpearella rubra.*

STATION 315. Anchorage East end of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Funcella juncea.*

It appears from this list that Gorgonellidæ were secured at 35 stations out of about 147 stations where the bottom was sucessfully explored with the dredge or trawl.

Station 310 seems to have yielded the greatest number of Gorgonellidæ, six species having been secured, the next best yield being Station 260 and Station 305 where five species were secured, while stations 204, 258 and 299 yielded four species each.

The most abundant species of Gorgonellidæ in the collection is *Funcella juncea*, which was secured at 12 stations, the next in abundance being *Scirpearella rubra* which was dredged from 11 stations; *Scirpearella gracilis* coming 3rd, being found at 8 stations. But one species of Gorgonellidæ was secured from each of 21 stations in the foregoing list.

Table showing the geographic and bathymetric distribution of the Gorgonellidae collected by the Siboga Expedition.

	BATHYMETRIC.				GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	Over 200 meters	
Gorgonella orientalis	·	*	*	*	Off Japan.
Gorgonella umbraculum	·	*	·	·	East Indies in general (Studer).
Gorgonella delicatula	·	*	·	·	
Gorgonella rigida	*	*	*	·	
Verrucella rubra	·	*	·	·	Gulf of Manaar.
Verrucella flaviflora	·	*	·	·	Red Sea.
Verrucella stellata	·	*	·	·	
Ctenocella pectinata	*	·	·	·	Indian Ocean, New Guinea, China Sea, Australian
Juncella juncea	*	*	·	·	Indian Ocean. [waters.
Juncella gemmacea	*	·	·	·	Red Sea.
Juncella racemosa	*	*	·	·	Japan.
Juncella sanguinea	*	·	·	·	
Scirpearella rubra	*	*	*	·	Off Hyalonema Ground, Japan.
Scirpearella gracilis	*	*	*	*	Off New Hebrides.
Scirpearella regia	*	·	·	·	
Scirpearella hemispherica	*	·	·	·	
Nicella coralloides	·	*	*	·	
Nicella carinata	*	*	*	·	
Ellisella flava	·	*	·	·	
Plumigorgia hydroides	*	·	·	·	
Isidoides armata	·	·	·	*	
Totals	12	14	6	3	

This table shows clearly that the Gorgonellidæ are essentially shallow water forms, all but one of the twenty one species in the Siboga collection having been secured from waters less than 100 meters in depth. While six species in the above list are known to be from more than 100 meters, but three of these *Scirpearella gracilis*, *Gorgonella orientalis* and *Isidoides armata*, were taken from over 200 meters by the Siboga Expedition. The records show that about 80 hauls of the dredge or tawl were taken in over 200 meters, and these should have yielded more than three species of Gorgonellidæ, if that family is at all common at such depths.

The deepest water from which a gorgonellid was taken was at Station 208 where *Scirpearella gracilis* was dredged. This species also has a very remarkable bathymetric range, being found from 34 to 1886 meters. *Isidoides armata* was taken from a depth of 984 meters.

The geographical distribution indicated by the table is, as would be expected from the bathymetric table, much more restricted than would have been the case with more characteristic deep water forms. All of the species represented by the Siboga collection are restricted to the Indo-Pacific region. A few species of the family Gorgonellidæ are, however, found outside of this region, at least five species *Verrucella gnadalupensis*, *V. ramosa*, *V. granulifera*, *Juncella extans* and *J. hystrix* having been reported from the Atlantic.

It remains true, however, that the apparent centre of distribution for this family is in the Oriental region and that its occurence elsewhere is exeptional.

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EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. DAYTON STONER.

PLATE I.

Fig. 1. *Verrucella flaviflora* (new name), Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Gorgonella delicatula* n. sp. Natural size 2 *a*, part of branch × 5.
Fig. 3. *Gorgonella rigida* n. sp. Natural size. 3 *a*, part of branch × 5.

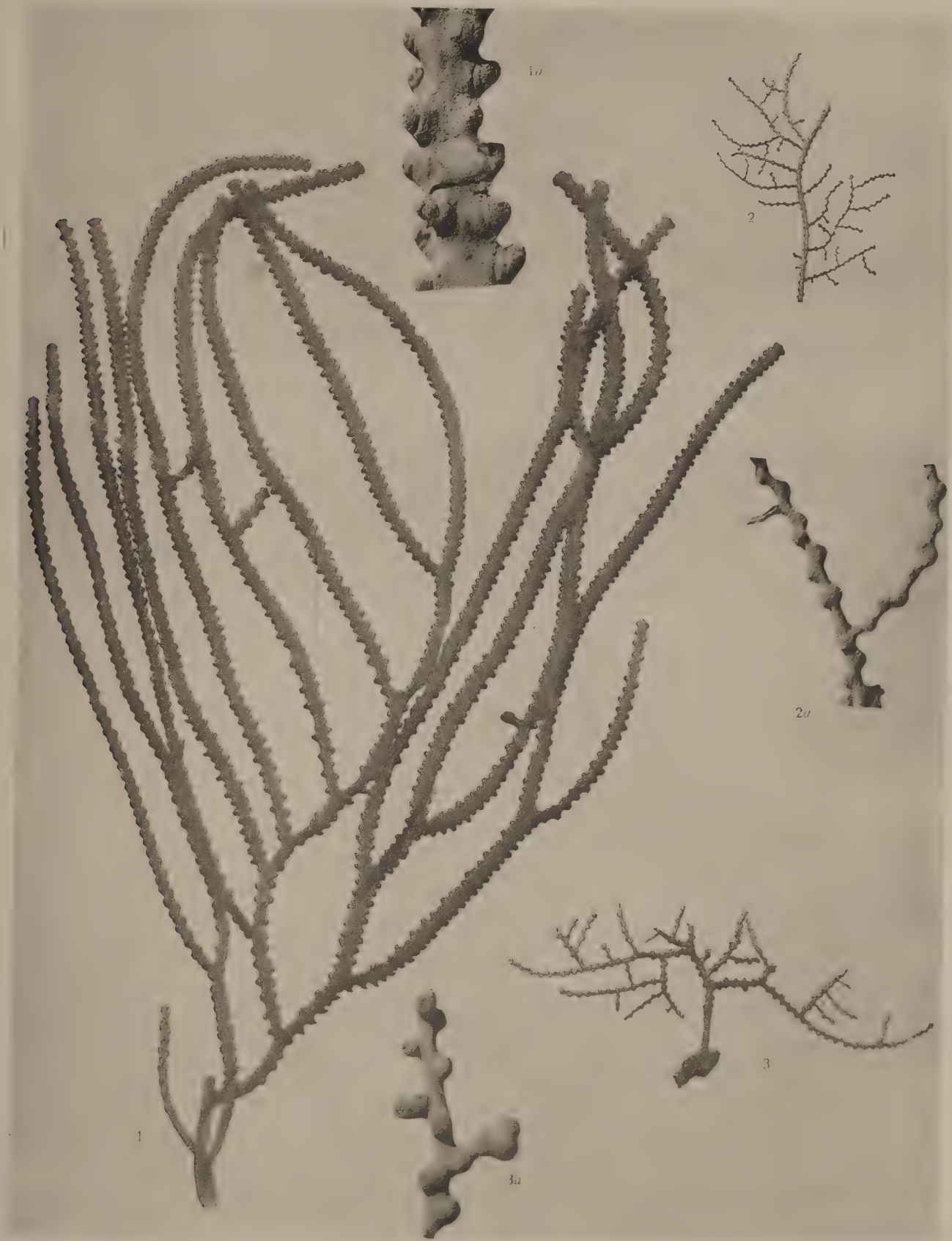

1a
2
2a
1
3
3a

PLATE II.

Fig. 1. *Verrucella stellata* n. sp. Natural size. 1 *a*, part of tip of branch × 5.

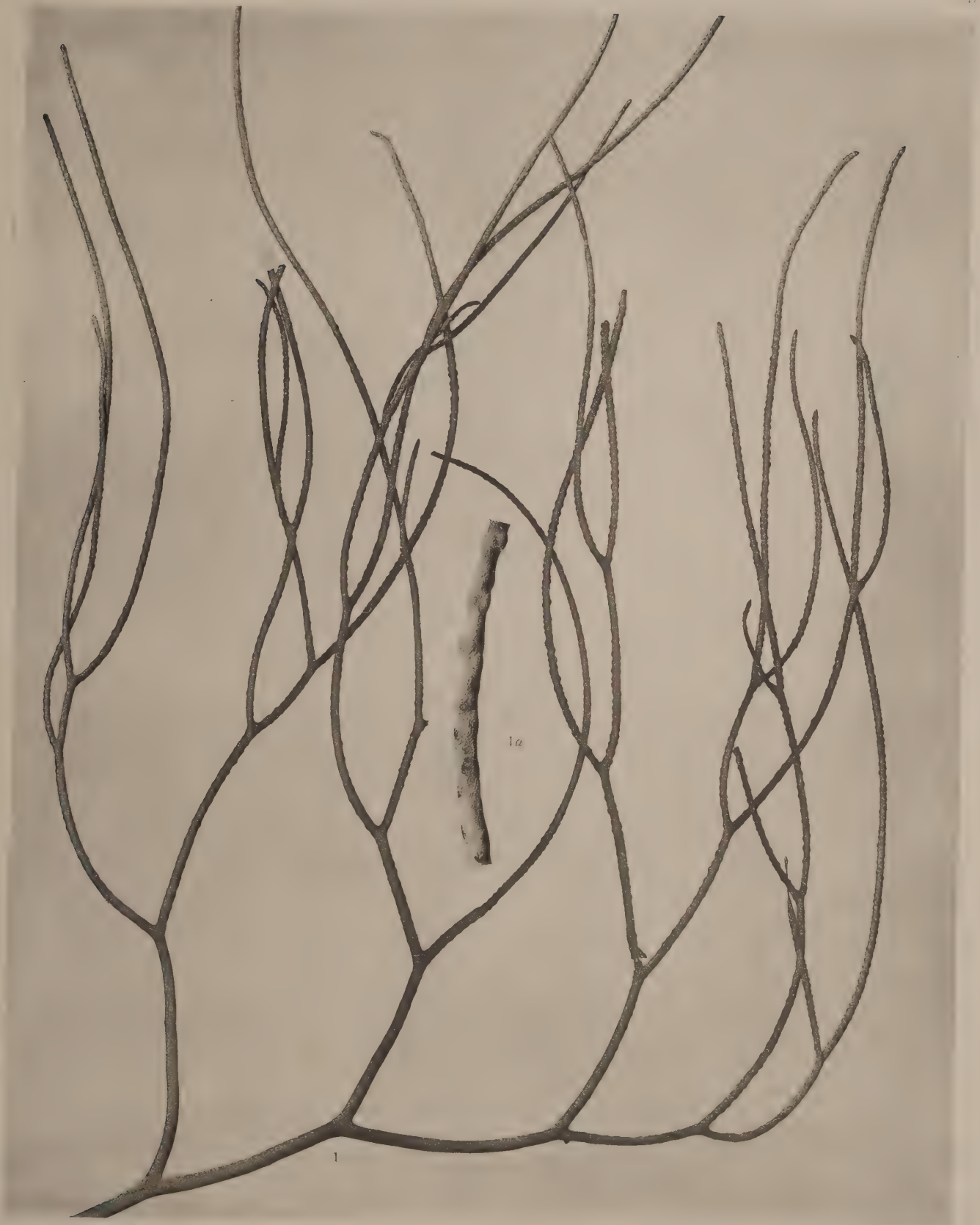

1a
1

PLATE III.

Fig. 1. *Juncella juncea* (Pallas). Part of large red specimen, natural size.
Fig. 2. *Juncella juncea.* Part of another colony, red, with calyces more prominent. Natural size. 2 *a*, part of same specimen × 5.
Fig. 3. *Juncella juncea.* Part of a white colony, showing median impressed line. Natural size.
Fig. 4. *Juncella juncea.* Part of another white colony, much smaller. Natural size.

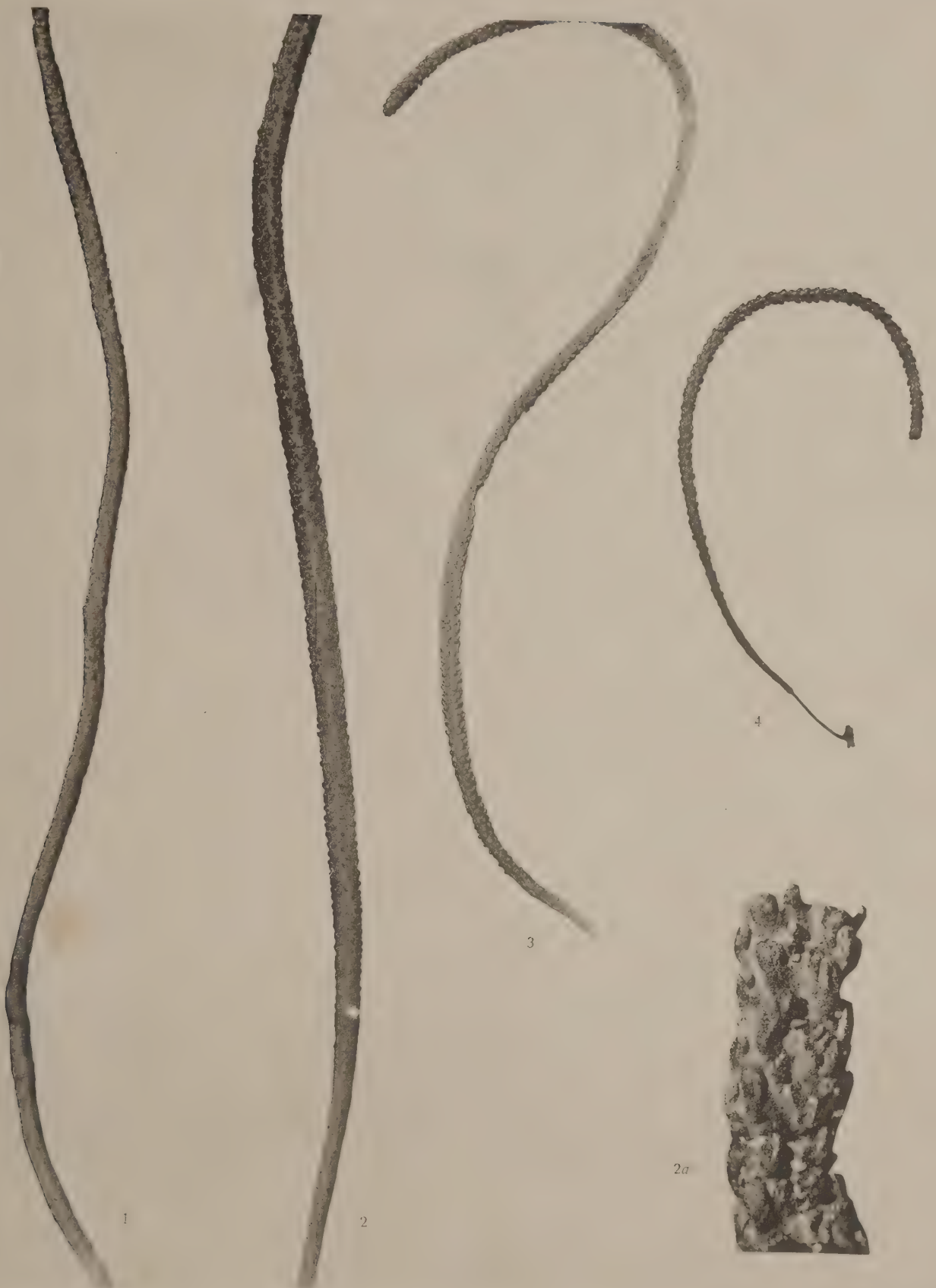

1
2
3
4
2a

PLATE IV.

Fig. 1. *Juncella gemmacea* (Val.). Natural size. 1 *a*, part of branch × 5.

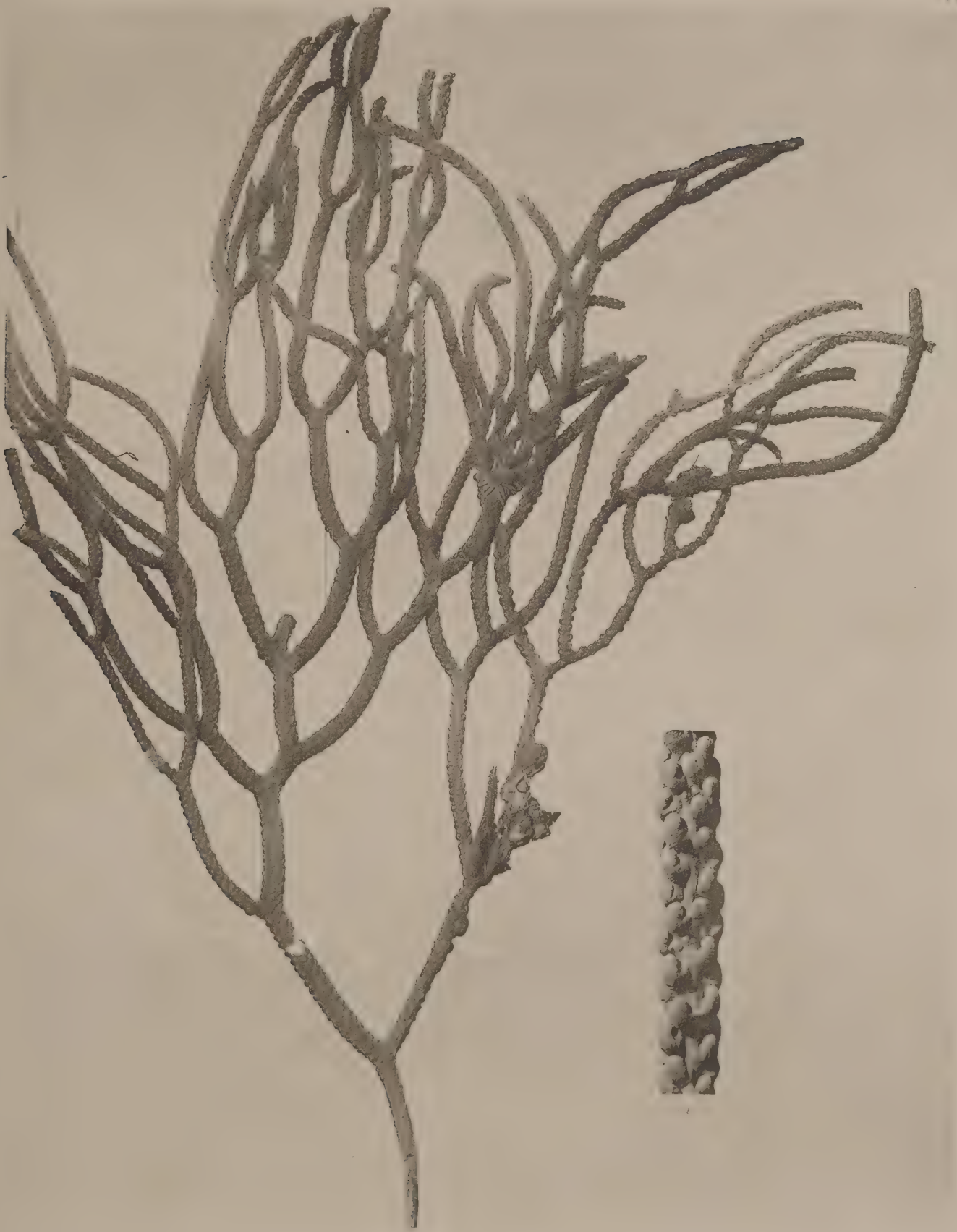


PLATE V.

Fig. 1. *Juncella sanguinea* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Scirpearella hemispherica* n. sp. Natural size. 2 *a*, part of branch × 5.

1
1a
2
2a

PLATE VI.

Fig. 1. *Scirpearella rubra* W. and S. Large red colony. Natural size. 1 *a*, part of colony × 5.
Fig. 2. *Scirpearella rubra*. Smaller red specimen. Natural size.
Fig. 3. *Scirpearella rubra*. More slender, white form. Natural size.
Fig. 4. *Scirpearella rubra*. Small red specimen. Natural size.
Fig. 5. *Scirpearella rubra*. Young colony, white, with opposite calyces. Natural size.

PLATE VII.

Fig. 1. *Scirpearella gracilis* W. and S. Fairly large colony, with calyces on all sides. Natural size. 1 *a*, part of colony × 5.

Figs. 2, 3 and 4. Smaller colonies of the same species, with alternate calyces. Natural size. 3 *a*, part of colony × 5.

Fig. 5. A very young colony, same species, with very regular lateral and alternate calyces.

1
1a
2
3
3a
4
5

PLATE VIII.

Fig. 1. *Scirpearella regia* n. sp., with meter rod at right to show actual size. 1 *a*, part of branch × 5.
Fig. 2. *Isidoides armata* n. sp. Natural size. 2 *a*, part of branch × 5.

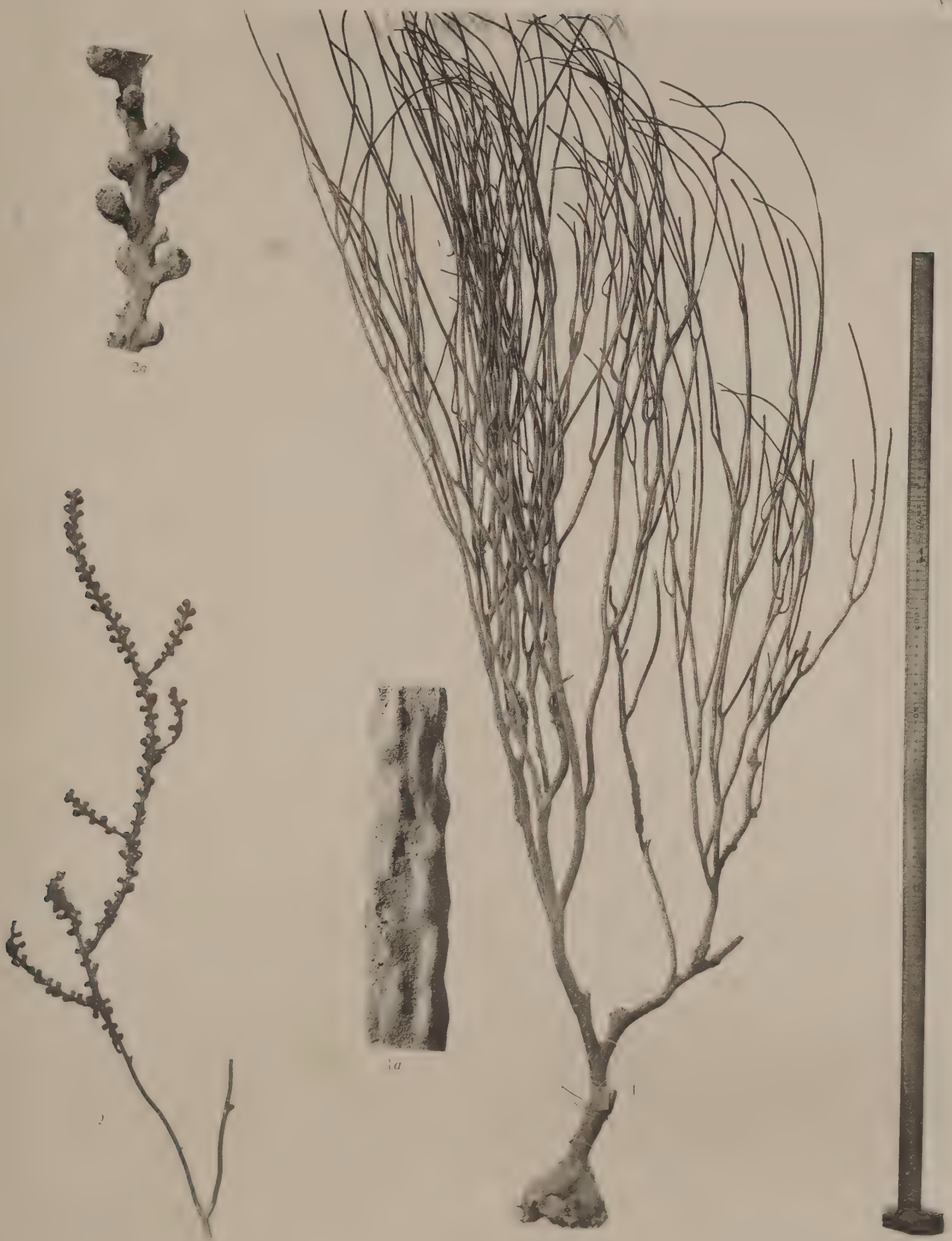


PLATE IX.

Fig. 1. *Nicella carinata* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Nicella coralloides* n. sp. Natural size. 2 *a*, part of branch × 5.
Fig. 3. *Plumigorgia hydroides* n. sp. Natural size. 3 *a*, part of colony × 5.
Fig. 4. *Ellisella flava* n. sp. Natural size. 4 *a*, part of branch × 5.

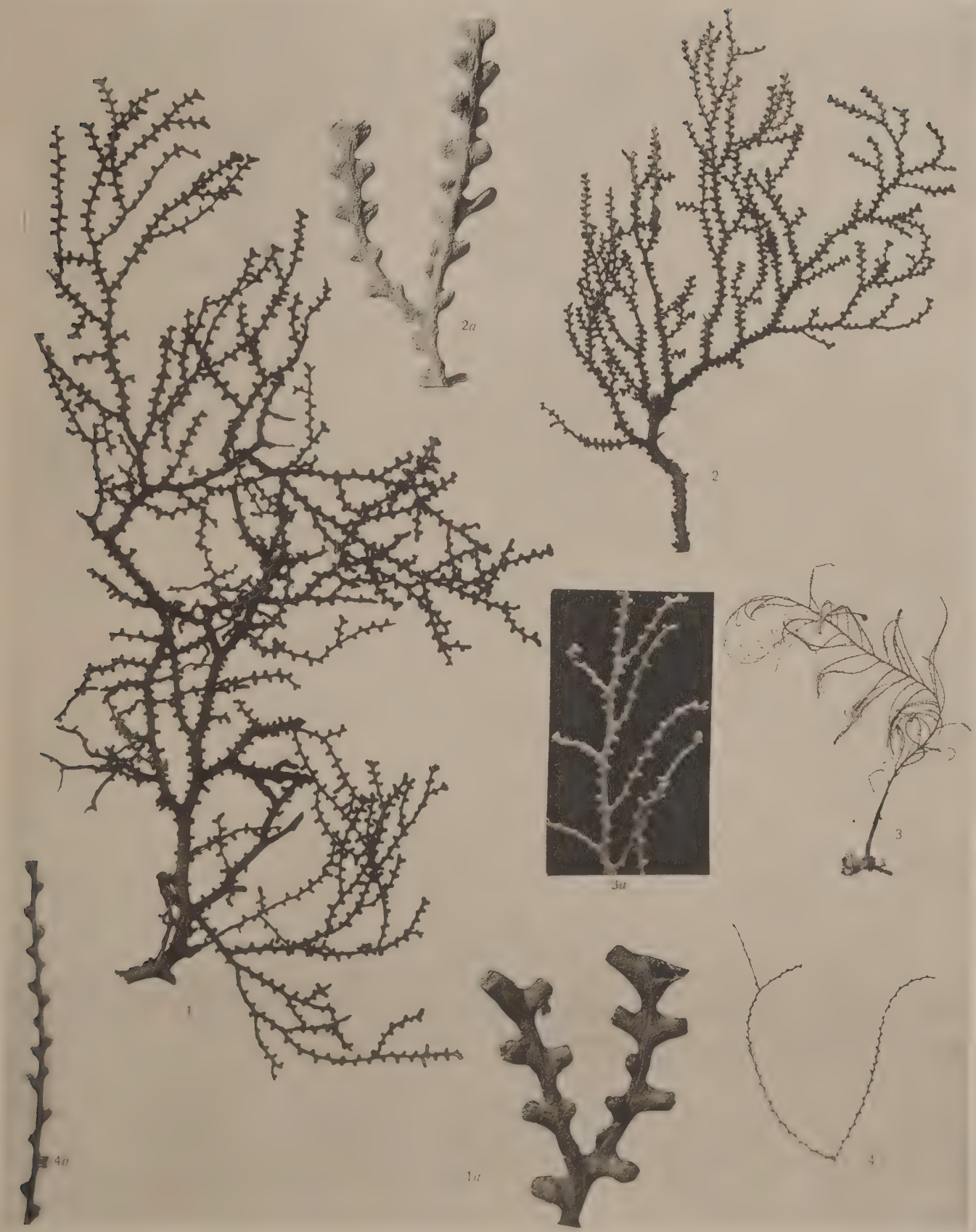
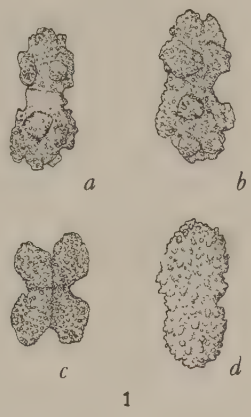

2a
2
3a
3
4a
1a
4

PLATE X.

Fig. 1. *Gorgonella delicatula* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 2. *Gorgonella rigida* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 3. *Verrucella stellata* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 330.
Fig. 4. *Funcella sanguinea* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 5. *Scirpearella regia* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 6. *Scirpearella hemispherica* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.



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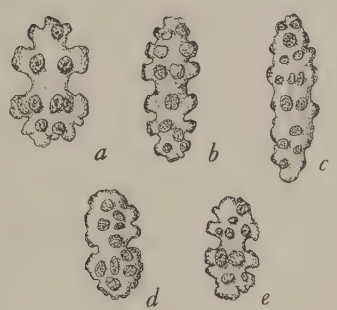
2.



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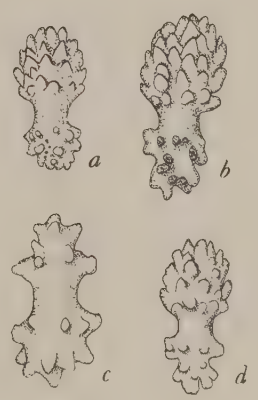

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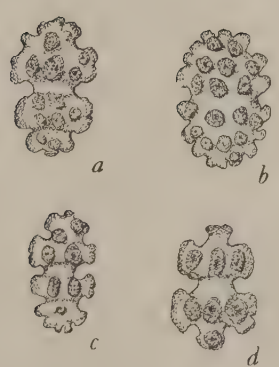

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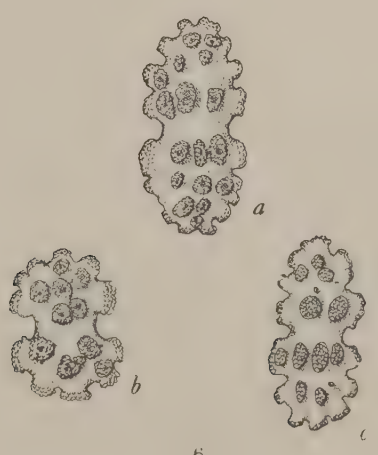

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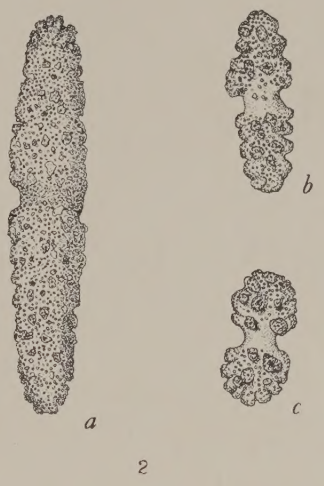
PLATE XI.

Fig. 1. *Nicella coralloides* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 330.
Fig. 2. *Nicella carinata* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.
Fig. 3. *Ellisella flava* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.
Fig. 4. *Plumigorgia hydroides* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 5. *Isidoides armata* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 110.

1



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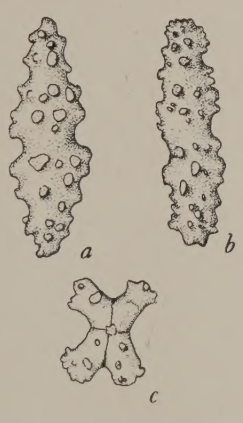

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4

5

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